2011 Annual Report

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Acknowledgements

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Communicable Disease Surveillance 2011 Annual Report

Note: This report does **not** include a summary of sexually transmitted diseases, hepatitis (except hepatitis A), HIV, or environmental conditions.

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Missouri Profile 2011

Missouri is 69,697 square miles and slightly more than half of the population live in or near the two major cities, St. Louis, Kansas City. Missouri became a state in 1821 and has 114 counties. Jefferson City is the capital. The major flows of traffic within the state are from the east to west along the Missouri valley and southward along the Mississippi.

Missouri is geographically diverse, with tilled plains in the north, Ozark Mountains in the south and the presence of the Mississippi Alluvial Plain in the southeast part of the state.

Missouri's economy is also highly diversified. While wholesale, retail trade, manufacturing, and agriculture play significant roles in the state's economy, service industries provide more income and jobs than any other segment, and include a growing tourism and travel sector. Missouri is a leading producer of transportation equipment (including automobile manufacturing and auto parts), beer and beverages, and defense and aerospace technology. Food processing is the state's fastest-growing industry. Missouri mines produce 90% of the nation's principal (non-recycled) lead supply. Other natural resources include iron ore, zinc, barite, limestone, and timber. The state's top agricultural products include grain, sorghum, hay, corn, soybeans, and rice. Missouri also ranks high among the states in cattle and calves, hogs, and turkeys and broilers. A vibrant wine industry also contributes to the economy.

Population (2010)*	**5,988,927**	**Percent of Total Population**
Urban	63.0%	(Based on 2010 census)
Rural	37.0%	(Based on 2010 census)

Live Births	76,069
Deaths	55,999

Sex	**Population**	
Male	2,933,477	49.0%
Female	3,055,450	51.0%

Race	**Population**	**Percent of Total Population**
White	5,098,388	85.1%
Black	734,657	12.3%
Other	155,882	2.6%

Age Group	**Population**	
<1	76,119	1.3%
1-4	314,118	5.2%
5-14	787,388	13.1%
15-24	837,075	14.0%
25-39	1,143,537	19.1%
40-64	1,992,396	33.3%
65+	838,294	14.0%

District	**Population**	
Central	666,284	11.1%
Eastern	2,230,223	37.2%
Northwest	1,566,668	26.2%
Southeast	474,943	7.9%
Southwest	1,050,809	17.5%

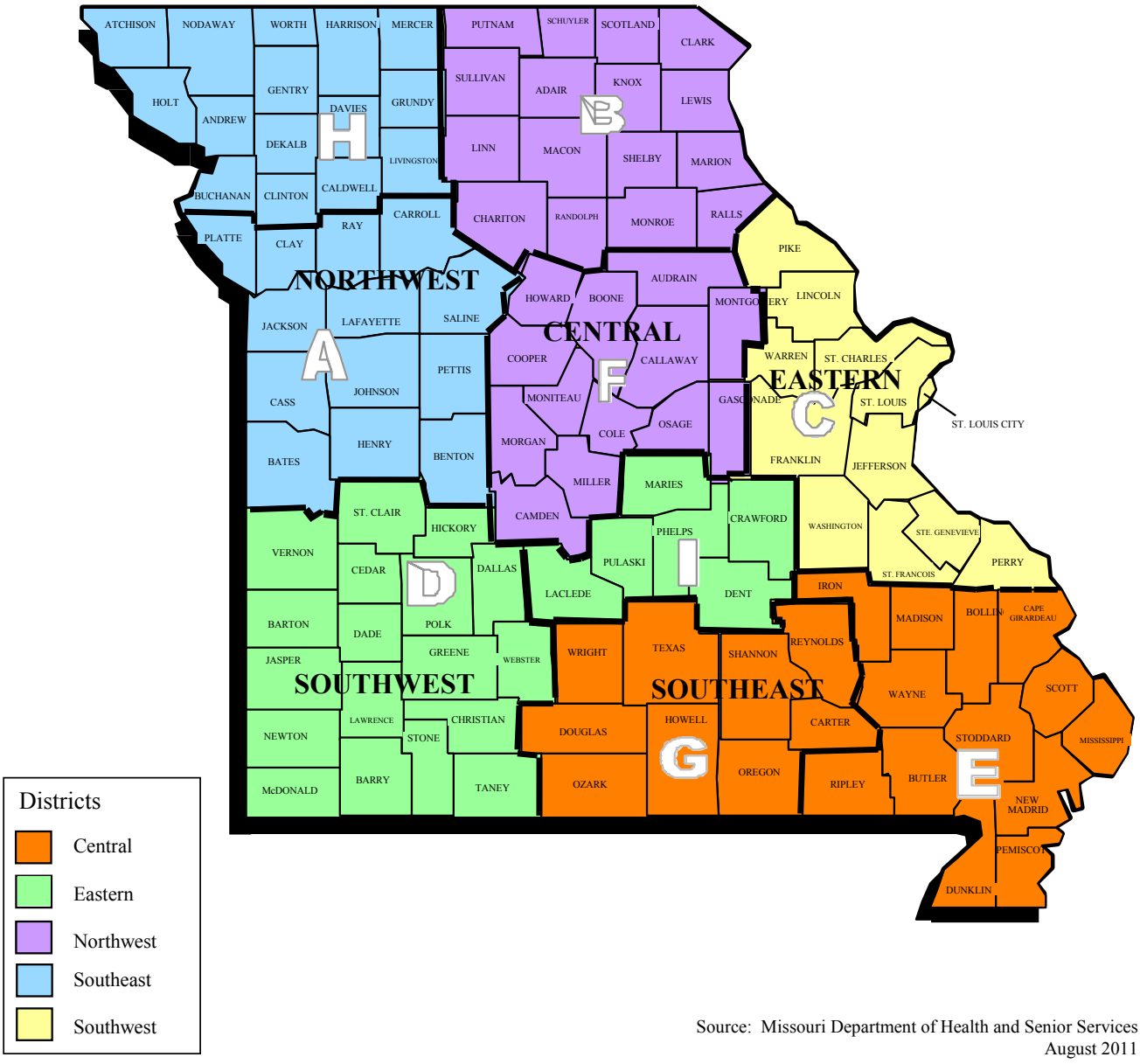
Leading Causes of Death:**	**Number of Deaths Reported**	**Percent of Total Deaths Reported**
Heart disease	13,746	24.5%
Malignant Neoplasms	12,403	22.1%
Chronic lower respiratory disease	3,483	6.2%
Unintentional injuries	3,178	5.7%
Cerebrovascular disease (stroke)	3,010	5.4%
Alzeheimer's disease	1,916	3.4%
Diabetes Mellitus	1,421	2.5%

*Unless otherwised noted, all percentages are based on 2010 population estimates.

**Not all causes of death are listed.

Data Provided by: Public Health Practice & Administrative Support Section, Bureau of Health Informatics, Department of Health and Senior Services.

Districts for Statewide Disease Investigation / Terrorism Response / TB Control



Source: Missouri Department of Health and Senior Services
August 2011

Introduction

The Bureau of Communicable Disease Control and Prevention (BCDCP) provides prevention, intervention, and surveillance programs for ninety-one reportable communicable (or infectious) diseases and conditions of public health significance in Missouri. Many of these diseases are emerging infections (such as Multi-drug-resistant tuberculosis and Novel Influenza). The program also maintains a statewide disease registry and surveillance system (WebSurv) and performs analysis of morbidity to identify trends and risk factors for public health messaging. In addition to WebSurv, the Electronic Surveillance System for Early notification of Community-Based Epidemics (ESSENCE) is a statewide syndromic surveillance system that examines chief complaint data from hospitals, emergency rooms, over the counter drug sales, and information from the poison control centers. The BCDCP works closing with 115 local public health agency (LPHA) partners to protect Missouri's citizens and visitors from the threats of infectious diseases of public health significance.

BCDCP services include:

- Conducting epidemiological studies to investigate the cause, origin, and method of transmission of communicable diseases in order to identify and implement appropriate disease control and preventive measures, such as contact identification, testing, treatment, and source identification.
- Identifying communicable disease surveillance data needs, design data collection processes/systems, develop and maintain data systems and datasets, analyze and interpret data at regular intervals to track trends and provide regular reports on these analyses to support targeted interventions.
- Consulting with LPHAs, government at all levels, community organizations, hospitals, health care providers, private businesses, media, and others regarding diagnosis, and control measures for reportable communicable diseases and provide public health education as requested.
- Providing training and technical assistance/consultation to local health officials on disease investigations, control activities, and analysis/interpretation of data to prevent communicable diseases in their communities and rapidly respond to outbreaks.
- Providing community planning and rapid epidemiologic response for emergencies such as bioterrorism, pandemic influenza, and natural disasters such as flooding, earthquakes and catastrophic weather events.
- Providing the treatment of tuberculosis (TB) disease or infection, as well as tuberculin skin testing materials for use in extended contact investigations and assisting LPHAs with TB case management.
- Providing assistance to local health officials in the screening and treatment of public health conditions in newly arriving refugees.
- Collaborating with other programs within the Missouri Department of Health and Senior Services (DHSS), other state and federal agencies, and community-based organizations in emergency event planning and response.

The DHSS rule for the **Reporting of Communicable, Environmental and Occupational Diseases**, can be found at: 19 CSR 20-20.020. This report contains information only for those diseases and conditions that are addressed by the BCDCP. Information and statistics for HIV, STD, and Hepatitis can be found by clicking on Bureau of HIV, STD, and Hepatitis.

Introduction

Data used in this report were gathered from disease and condition reports made by medical providers, laboratories, hospitals, LPHAs, and others.

The information collected through 19 CSR 20-20.020 flows from the local public health jurisdictions to DHSS and on to the national Centers for Disease Control and Prevention (CDC). Data are linked to the national level through the CDC's National Electronic Telecommunications Surveillance System (NETSS). This information is critical for two reasons:

1. It enables public health agencies to act quickly to prevent the spread of disease, and
2. It provides an overall view of disease trends at the local, state and national levels. Analysis of these trends permits targeting of scarce resources where they are most needed and allows the assessment of the effectiveness in preventing and controlling disease.

There are limitations to the data provided in this report for the following reasons:

- sick people do not always seek healthcare; and,
- healthcare providers and others do not always recognize, confirm, or report notifiable conditions.

Therefore, reported cases may represent only a fraction of the actual burden of disease.

BCDCP is pleased to provide the following summary of data relating to over 35,517 cases that were reported during calendar year 2011. In addition to the contributors listed on the previous page, BCDCP would like to recognize the staff of Missouri's State Public Health Laboratory and the thousands of people in LPHAs, clinics, hospitals and clinical laboratories throughout Missouri whose disease reports and efforts constitute the basis for this document. Without vigilant reporting of disease, targeted and effective prevention and control measures cannot be implemented.

While this report was compiled by DHSS, please keep in mind that most of the public health workforce is in city or county health departments. Therefore, much of the work is at that level. The state, county, and city health departments and their private-sector partners work to promote health, protect against illness and injury, and render public health services to all people in Missouri.

A table of all reported notifiable diseases is located here. Where spatial analysis and use of Geographic Information Systems (GIS) was useful, maps have been provided to depict the data. Hyperlinks to additional information are included throughout the document.

The hope is that you find this report informative and useful. Your questions and comments are invited on this report, "Communicable Disease Surveillance 2011 Annual Report".

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Executive Summary

Each year in Missouri, through the efforts of the LPHAs and state partners, communicable disease investigation and control efforts demand a substantial amount of public health resources. In 2011, a total of 35,517* conditions were reported, investigated, and entered into Missouri's communicable disease registry system, WebSurv. The information from WebSurv is used to monitor trends at state, district, and local levels. Data entered into this system are likewise transmitted to the CDC, which allows Missouri to contribute to national communicable disease trends and helps inform national disease surveillance programs.

The Missouri State Public Health Laboratory (MSPHL) is an important partner in communicable disease investigation and control efforts. The MSPHL provides technical assistance through consultations, both with LPHAs and their respective hospitals, as well as offering specialized testing services. In 2011, the MSPHL performed 3,000,856 analyses in support of many diverse public health programs and further conducted specialized procedures as a reference laboratory for many hospitals/private laboratories. The MSPHL analyzes samples from Missouri and non-Missouri residents. Their continued contribution to Pulse Net, an electronic system that tracks DNA fingerprints of specific organisms that cause food borne disease, allows BCDCP to more readily identify potential outbreaks both locally and nationally.

The following document represents a summary of the diseases of public health significance in Missouri communities; the hope is that the information can be used to prevent additional cases. The conditions selected for this year's focus include four gastrointestinal illnesses (Cryptosporidiosis, Escherichia coli Shiga toxin-producing *E. coli* (STEC) infection, Listeriosis and Shigellosis), two respiratory illnesses, (one bacterial cause (Streptococcus pneumonia) and one viral cause (Influenza)), one rare arthropod transmitted disease (Malaria) almost exclusively imported, a group of arthropod transmitted diseases very common to the state (Rocky Mountain Spotted Fever/Spotted Fever Rickettsiosis) as well as Rabies, Animal and Human, and Rabies post-exposure Prophylaxis (RPEP).

A total of 495 cases of cryptosporidiosis were reported in Missouri in 2011. This represented a 130% increase above the five-year median for this particular disease. More than 73% of the 2011 Missouri cases were reported during the summer months, with 200 cases reported in the month of August alone. Nearly half of the 495 cases reported had some type of recreational water exposure prior to illness onset. Additionally, two cryptosporidiosis outbreaks were reported in 2011. One occurred in the Northwest District and was attributed to a recreational water venue; the other was in the Southwest District and the source was undetermined.

Statewide in 2011, a total of 282 cases of STEC associated infections were reported, which was an 84% increase in the number of cases compared to the previous five-year median. The most life-threatening complication of E. coli infection is hemolytic uremic syndrome (HUS). Although rare, HUS is very serious and can require dialysis and/or lead to the death of up to 5% of those who develop the condition. A total of 20 cases of HUS were reported among residents of Missouri in 2011, which is an increase of 122% compared to the previous five-year median. Seventy percent of HUS cases were reported among children 14 years of age or younger. The increase in cases is in part attributable to three outbreaks that occurred during 2011 across the state. One notable outbreak was significant in that it was the fourth largest known

Executive Summary

E. Coli 0157:H7 outbreak in U.S. history, as reported by CDC. That outbreak alone accounted for 42 confirmed cases in Missouri residents.

There were 22 cases of *Listeria* reported statewide in 2011. This was an increase of 83.3% when compared to the 5-year median. Listeriosis is a relatively uncommon but severe invasive infection caused by *Listeria monocytogenes*. This year marked a point when the incidence rate rose above the historic level in the state for the past 10 years. The increase in cases was due, in part, to a multistate outbreak of *Listeria* associated with cantaloupe which was detected in September, 2011. For Missouri, seven cases were reported that matched this outbreak. Death attributed to *Listeria* was reported in three of those cases.

For Missouri in 2011, there were 182 reported cases of Shigellosis. This disease stands out due to the reported decrease of 88.5% from the 1,582 cases reported in 2010. This represents an 82.6% decrease from the 5-year median of 1,046 cases. To contrast the previous year, there was only one reported outbreak during 2011 compared to six that had occurred during 2010. The outbreak in 2011 occurred in Southwest District and was associated with an elementary school.

S. pneumoniae invasive disease is reportable for children under five years of age; in 2011, a total of 34 cases of invasive *S. pneumoniae* infections were reported among children less than five years of age in Missouri. This represents a 12.5% decrease from the previous five year median. No outbreaks of invasive *S. pneumoniae* were reported among Missouri children less than five years of age in 2011. Invasive disease due to *S. pneumoniae* is reportable in Missouri if the organism is resistant to approved antibiotics; 105 such cases were reported in 2011. This was a very slight increase over the rate seen for 2010. Prior to 2008, the rates in Missouri were typically below the rates nationally. During the last four years, the rates in Missouri have been slightly above the national rates. The fluctuation in rates of the disease in Missouri is not fully understood. No outbreaks of invasive drug-resistant invasive *S. pneumoniae* infections were reported among Missouri residents in 2011.

In comparison to other seasons, the 2011-2012 Influenza season set a new record for the lowest and shortest peak of influenza-like illness. The season began late and was mild compared to most previous seasons for which surveillance data is available.

Missouri experienced a significant increase in the number of reported Malaria cases in 2011 (21 cases), which was a 50% increase in the number of cases compared to the five-year median data. All of the cases of malaria reported in Missouri whose travel history was known had traveled to countries known to be endemic for malaria. Malaria is an illness that is usually preventable for travelers. Preventative medication or chemoprophylaxis is available and should be taken by travelers visiting these areas.

Missouri's most common tick-borne diseases are members of a group of acute febrile illnesses with skin eruptions that are also known as "spotted fevers." In 2011, Missouri LPHAs identified 270 confirmed and probable cases of RMSF illness. In the last 10 years, Missouri's RMSF incidence rate has ranged from a low of less than 1 case per 100,000 in 2003 to a record high of almost 7 cases per 100,000 in 2008. The 4.5

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cases per 100,000 rate for 2011 is substantially lower than the 2008 rate; however, Missouri's RMSF incidence rate has remained at a level of more than 4 cases per 100,000 in four of the last five years. The national rate has ranged from 0.4 to 0.8 since 2002.

Rabies is a fatal viral illness that affects only mammals. During 2011, 29 cases of animal rabies (16 bats and 13 skunks) were detected in Missouri, compared to 63 cases the previous year, representing a 54% decrease. This sharp drop may have been the result of fewer specimen submissions due to increased emphasis on ensuring that specimens were submitted only when there was a public health or medical reason to do so. Exposure to a possibly rabid animal or inability to locate a biting animal may dictate an individual start the RPEP series. RPEP (initiated) was reported 345 times during 2011, which was almost 49 percent above the five-year median of 232 reports. No human rabies deaths were recorded in Missouri in 2011.

This is a sample of the information contained within the 2011 Annual Report. It should be noted that Missouri's LPHA partners contributed significantly to communicable disease surveillance, control, and prevention efforts in 2011.

* The figure "35,517" refers to all reportable communicable diseases that are monitored by the Bureau of Communicable Disease Control and Prevention. This does not include sexually transmitted diseases, HIV/AIDS, Hepatitis B (acute and chronic), Hepatitis C (acute and chronic) and conditions that are not infectious. Separate reports are available from DHSS for these diseases/conditions.

Section A - Communicable Disease Surveillance

Disease Outbreaks

BCDCP maintains a database and provides on-site and technical assistance to the LPHAs on reported outbreaks. BCDCP also contributes to several national reporting systems such as the National Outbreak Reporting System (NORS), CDC's OutbreakNet Team, and PulseNet, national network of public health and food regulatory agency laboratories coordinated by CDC. These systems are used to rapidly identify potential outbreaks in order to implement effective measures to prevent illness and reduce the public health threat. BCDCP reviews outbreaks for lessons learned and any new information on disease reservoirs, modes of transmission, control strategies and provide data to CDC for national analysis.

Diseases and Conditions	Number of Outbreaks
Gastrointestinal	
Acute Gastrointestinal Illness - etiology unknown	23
Clostridium difficile	1
Cryptosporidiosis	2
E. coli O157:H7	4
Listeria	1
Norovirus	17
Salmonellosis	7
Shiga toxin-producing *E. coli*	1
Shigellosis (*S. sonnei*)	1
Total	**57**
Vaccine Preventable	
Pertussis	4
Varicella (Chickenpox)	2
Total	**6**
Respiratory	
Acute Respiratory Illness	1
Influenza	2
Respiratory Syncytial Virus	1
Total	**4**
Other	
Fifth Disease	1
Hand, Foot, and Mouth Disease	1
Mucormycosis (Apophysomyces trapeziformis)	1
Pediculosis	1
Rash (unknown agent)	1
Scabies	6
Staph aureus	1
Strep Group A	1
Strep throat	1
Unknown (Oral Lesions)	1
Total	**15**
Total Outbreaks	**82**

Diseases of Note

There are several notable decreasing and increasing disease trends as reflected in the 15 year report.

Decreasing Trends:

- Shigellosis, with 182 cases reported in 2011, decreased 88.5% from the 1,582 cases reported in 2010. There was one reported outbreak in 2011; compared to six reported outbreaks in 2010.

Increasing Trends and/or Significant Increases:

- *E. coli* O157:H7, with 122 cases reported in 2011, increased 16.2% from the 105 cases reported in 2010. There were four reported outbreaks of *E. coli* O157:H7 reported in 2011. For additional information, click here.
- Listeria, with 22 cases reported in 2011, increased 83.3% from the 12 cases reported in 2010. There was one reported outbreak of listeria in 2011. For additional information, click here.

Section A - Communicable Disease Surveillance

Comparative Statistics, Reported Diseases, Missouri 2011

Reportable Diseases and Conditions entered into the Missouri Health Surveillance Information System (WebSurv)	Case Count	5-Year First Quartile	5-Year Median	5-Year Third Quartile	Percent Change from 5-Year Median	Rate per 100,000
Adult Respiratory Distress Syndrome (ARDS)	7	1	3	3	133.30%	0.1
Animal Bites	6,638	5,348	6,288	6,917	5.60%	110.8
Campylobacteriosis	919	722	770	815	19.40%	15.3
Chlamydia	27,887	23,308	24,817	25,868	12.40%	465.6
Coccidioidomycosis	18	3	9	11	100.00%	0.3
Creutzfeldt-Jakob Disease (CJD)	8	5	6	8	33.30%	0.1
Cryptosporidiosis	495	195	214	283	131.30%	8.3
Cyclosporiasis	1	0	0	0	N/A	0
E Coli Shiga Toxin Positive	160	75	77	77	107.80%	2.7
E. Coli (All)	282	152	153	167	84.30%	4.7
E. Coli O157 H7	122	76	80	90	52.50%	2
Eastern Equine Viral Encephalitis or Meningitis	1	0	0	0	N/A	0
Ehrlichiosis (All)	194	142	167	222	16.20%	3.2
Giardiasis	344	468	515	524	-33.20%	5.7
Gonorrhea	7,802	7,159	8,014	9,876	-2.60%	130.3
HIV Disease	515	536	575	585	-10.40%	8.6
Haemophilus Influenzae, Invasive	80	42	63	72	27.00%	1.3
Hansen's Disease (Leprosy)	2	0	1	2	100.00%	0
Hemolytic Uremic Syndrome	20	8	9	13	122.20%	0.3
Hepatitis A Acute	17	27	30	45	-43.30%	0.3
Hepatitis B (Infant) Perinatal	2	0	0	0	N/A	0
Hepatitis B (Pregnancy) Prenatal	141	133	136	136	3.70%	2.4
Hepatitis B Acute	60	40	47	62	27.70%	1
Hepatitis B Chronic Infection	278	239	248	328	12.10%	4.6
Hepatitis C Acute	8	2	5	6	60.00%	0.1
Hepatitis C, Chronic Infection	5,040	4,463	4,831	4,842	4.30%	84.2
Hepatitis E Acute	1	0	0	0	N/A	0
Influenza Death lt 18 Years	1	0	0	0	N/A	0
Influenza*	20,474	14,845	17,739	30,567	15.40%	341.9
Legionellosis	57	37	50	65	14.00%	1
Listeriosis	22	11	12	12	83.30%	0.4
Lyme	8	6	10	10	-20.00%	0.1
Malaria	21	8	14	14	50.00%	0.4
Meningococcal Disease	15	18	23	26	-34.80%	0.3
Mumps	11	10	12	15	-8.30%	0.2
Non-Neuroinvasive St Louis	1	0	0	1	N/A	0
Pertussis	438	308	561	604	-21.90%	7.3
Q Fever (All)	1	3	5	11	-80.00%	0
Rabies Animal	29	63	64	65	-54.70%	N/A
Rabies Post Exposure Prophylasis	345	159	232	259	48.70%	5.8
Rocky Mountain Spotted Fever	270	253	278	315	-2.90%	4.5
Salmonellosis	900	764	764	766	17.80%	15
Shigellosis	182	658	1,046	1,276	-82.60%	3
Staph Aureus VISA	1	1	1	3	0.00%	0
Strep Disease, Group A Invasive	151	91	94	97	60.60%	2.5
Strep Pneumo (All)	140	94	115	131	21.70%	2.3
Strep Pneumoniae, Drug-Resistant	105	65	74	91	41.90%	1.8
Strep Pneumoniae, lt 5 Years, Invasive	34	29	40	41	-15.00%	0.6
Syphilis, Primary and Secondary	136	168	173	224	-21.40%	2.3
Tetanus	2	2	2	2	0.00%	0
Toxic Shock (Staph) Syndrome	2	2	3	4	-33.30%	0
Tuberculosis	98	104	107	107	-8.40%	1.6
Tuberculosis Infection	2,949	3,393	3,573	3,837	-17.46%	49.2
Tularemia	21	14	18	21	16.70%	0.4
Typhoid Fever	1	2	2	3	-50.00%	0
Varicella (Chickenpox)	256	573	774	944	-66.90%	4.3
Vibriosis	3	0	0	1	N/A	0.1
West Nile Fever and Viral Encephalitis-Meningitis	10	5	15	63	-33.30%	0.2
Yersiniosis	8	6	9	10	-11.10%	0.1

*Influenza is reported based on the Influenza Season Year. 2011 includes Weeks 40 to 52 of 2011 and Weeks 1 to 20 of 2012.
Data Source: WebSurv

Section A - Communicable Disease Surveillance

Cryptosporidiosis

Cryptosporidium is a microscopic parasite that causes the diarrheal disease cryptosporidiosis. Both the parasite and the disease are commonly known as "Crypto." There are many species of Cryptosporidium that infect humans and animals, the most common species in humans are *Cryptosporidium hominis*.

Table 1. Cryptosporidiosis, Comparative Statistics, by Socio-demographic Category, Missouri[1] 2011

		Case Count 2011	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		495	100.00%	8.3	214	131.30%
Sex	Female	267	53.90%	8.7	110	142.70%
	Male	228	46.10%	7.8	104	119.20%
Race	Black	76	15.40%	10.3	10	660.00%
	Other	9	1.80%	5.8	2	350.00%
	Unknown	52	10.50%	N/A	55	-5.50%
	White	358	72.30%	7	147	143.50%
Age Group	00 to <01	5	1.00%	6.6	7	-28.60%
	01 to 04	101	20.40%	32.2	43	134.90%
	05 to 14	105	21.20%	13.3	45	133.30%
	15 to 24	50	10.10%	6	22	127.30%
	25 to 39	123	24.80%	10.8	39	215.40%
	40 to 64	73	14.70%	3.7	47	55.30%
	65 plus	36	7.30%	4.3	18	100.00%
	Unknown	2	0.40%	N/A	1	100.00%
District	Central	36	7.30%	5.4	13	176.90%
	Eastern	48	9.70%	2.2	47	2.10%
	Northwest	333	67.30%	21.3	59	464.40%
	Southeast	12	2.40%	2.5	13	-7.70%
	Southwest	66	13.30%	6.3	77	-14.30%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2010 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System (WebSurv)

While this parasite can be spread in several different ways, water (drinking water and recreational water) is the most common method of transmission. *Cryptosporidium* is one of the most frequent causes of waterborne disease among humans in the United States. The parasite is protected by an outer shell that allows it to survive outside the body for long periods of time and makes it very tolerant to chlorine disinfection.

Symptoms of crypto generally begin 2 to 10 days (average 7 days) after becoming infected with the parasite. The most common symptom of crypto is watery diarrhea. Other symptoms may include: stomach cramps or pain, dehydration, nausea, vomiting, fever, or weight loss. Some people with crypto may be asymptomatic.

Symptoms usually last about 1 to 2 weeks (with a range of a few days to 4 or more weeks) in persons with healthy immune systems. Occasionally, people may experience a recurrence of symptoms after a brief period of recovery before the illness ends. Symptoms can come and go for up to 30 days. People with weakened immune systems may develop serious, chronic, and sometimes fatal illness.

A total of 495 cases of cryptosporidiosis were reported in Missouri in 2011. While comparison to the 2010 rate showed a decrease of more than one case per 100,000 persons (9.2 versus 8.3, respectively), the 2011 reported incidence exceeded the states five-year median by more than 130%. Females accounted for more than half of the cases, and the age groups with the highest rates of illness were children ages 1 to 14 years and adults 25 to 39 years. These age groups probably represent the groups most likely involved in recreational water activities.

Section A - Communicable Disease Surveillance

Cryptosporidiosis - Continued

More than 73% of the 2011 Missouri cases were reported between May 29th and September 30th, with 200 cases reported in the month of August alone. Nearly half of the 495 cases reported had some type of recreational water exposure prior to illness onset. Additionally, two cryptosporidiosis outbreaks were reported during the year (one each in the Northwest and Southwest Districts). The likely source of exposure in the Northwest outbreak was recreational water, with a large water park identified as the source. The source of the outbreak in the Southwest District could not be conclusively determined.

Comparison to National Data: Nationally, there appears to be a steady upward trend in the number of reported cases over the past decade. While Missouri experienced lower morbidity from 2007 to 2009, cryptosporidiosis incidence surpassed the national rate by a wide margin for most years since 2005.

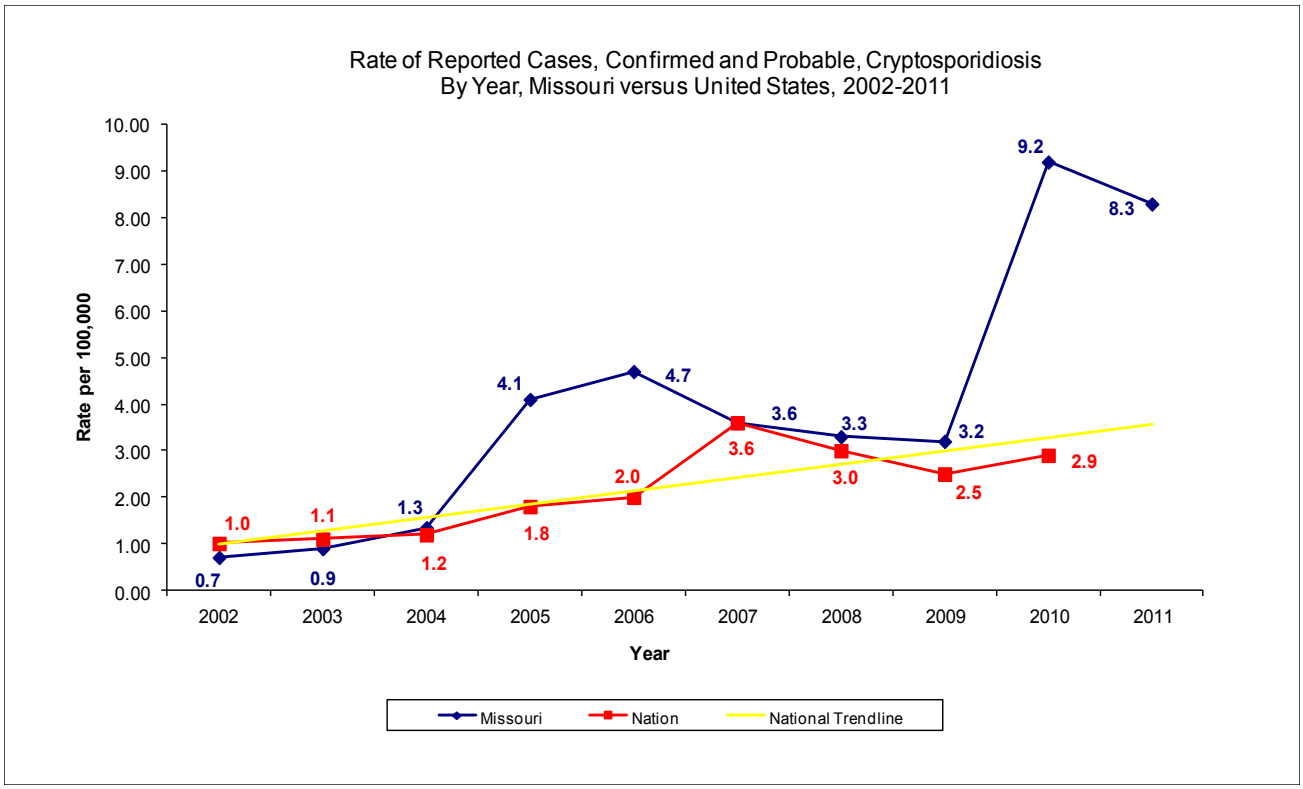
Cryptosporidium are resistant to chlorine, a chemical commonly used to control disease-causing organisms in potable and recreational water sources. In 60% of the 134 water-borne disease outbreaks reported in the United States between 2006 and 2008, cryptosporidium was identified as the likely etiologic agent.

Every year, millions of Americans enjoy oceans, lakes, rivers, pools, and spas. While these types of venues are important sources of fun and physical exercise, it is important that recreational water users are aware of the risk of contracting or spreading illnesses like cryptosporidiosis, and how they can protect themselves and their families. CDC and several other agencies worked together to develop comprehensive guidance materials for the prevention and control of recreational water illnesses (RWIs) which are available at: http://www.cdc.gov/healthywater/swimming/index.html

The resources available on the website include: information on all types of water venues, health promotion materials, training and certification for aquatic staff, and a Model Aquatic Health code (MAHC) for state and LPHAs. There are no uniform national standards governing design, construction, operation, and maintenance of swimming pools and other recreational water venues. Thus, the code requirements for preventing and responding to recreational water illnesses can vary significantly between jurisdictions. An MAHC would ensure that the best available standards and practices for protecting public health are available for adoption by all.

Section A - Communicable Disease Surveillance

Cryptosporidiosis - Continued



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Section A - Communicable Disease Surveillance

Escherichia coli (*E. coli*) and Hemolytic Uremic Syndrome (HUS)

E. coli
HUS

Escherichia coli (*E. coli*) are a diverse group of bacteria commonly found in the gut of warm blooded animals. Several types of *E. coli* exist as part of the normal flora of the human gut and have beneficial functions and most *E. coli* strains pose no harm to human health. However, several strains are known to cause disease in humans. Many of the disease causing strains of the bacteria produce toxins called Shiga toxins, and are often collectively referred to as Shiga toxin-producing *E. coli* (STEC). The primary source of STEC is the intestinal tract of cattle; but, it has also been isolated from other animals including sheep, goats, deer and others. Humans can also serve as a source of the bacteria with illnesses resulting from person-to-person transmission.

Table 1. Shiga toxin-producing *E. coli* (STEC)
Comparative Statistics, by Socio-demographic Category, Missouri[1] 2011

		Case Count 2011	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		282	100.00%	4.7	153	84.30%
Sex	Female	158	56.00%	5.2	80	97.50%
	Male	124	44.00%	4.2	76	63.20%
Race	Black	22	7.80%	3	5	340.00%
	Other	2	0.70%	1.3	1	100.00%
	Unknown	53	18.80%	N/A	37	43.20%
	White	205	72.70%	4	115	78.30%
Age Group	00 to <01	8	2.80%	10.5	6	33.30%
	01 to 04	67	23.80%	21.3	39	71.80%
	05 to 14	51	18.10%	6.5	36	41.70%
	15 to 24	43	15.20%	5.1	26	65.40%
	25 to 39	42	14.90%	3.7	16	162.50%
	40 to 64	49	17.40%	2.5	23	113.00%
	65 plus	22	7.80%	2.6	13	69.20%
District	Central	29	10.30%	4.4	17	70.60%
	Eastern	118	41.80%	5.3	55	114.50%
	Northwest	43	15.20%	2.7	29	48.30%
	Southeast	20	7.10%	4.2	13	53.80%
	Southwest	72	25.50%	6.9	36	100.00%

[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2010 population estimates provided by MDHSS, Bureau of Health Informatics.
Data Source: Missouri Health Surveillance Information System (WebSurv)

The primary STEC strain in the United States is *E. coli O157:H7*, which was first identified as a human pathogen in 1982. Other non-*O157* STEC strains including *O26, O45, O103, O111, O121,* and *O145* have also been identified as causes of diarrheal illness in the United States.

The illness caused by STEC includes diarrhea ranging from mild and non-bloody to stools that are virtually all blood. Other symptoms may include severe stomach cramps and vomiting. Symptoms typically begin within 3-4 days following exposure, but can range from 1 to 10 days. Most persons with a STEC associated illness will get better within 5 to 7 days. However, approximately 8% of persons, up to 20% of children, diagnosed with *E. coli O157* STEC infection will develop a potentially life-threatening complication called hemolytic uremic syndrome (HUS). The condition is often severe as half of persons with diarrhea associated HUS will require dialysis, and up to 5% who develop HUS will die. *Non-O157:H7* STEC strains are less likely to cause severe illness than *E. coli O157:H7*, however, these infections can also result in severe complications including HUS.

Section A - Communicable Disease Surveillance

E. coli (all) and HUS - Continued

Statewide in 2011, a total of 282 cases of STEC associated infections were reported, which was an 84% increase in the number of cases compared to the previous five-year median. The incidence rate for the year was 4.7 cases per 100,000 population and represents the highest rate of reported STEC cases observed over the past decade. Cases were reported from all age groups. Fifty-six percent of reported STEC cases were female. For cases whose race was known, the rate of disease was 9.3 times greater among whites compared to blacks.

A total of 20 cases of HUS were reported among residents of Missouri in 2011, which is an increase of 122% compared to the previous five-year median. Seventy percent of HUS cases were reported among children 14 years of age or younger. Females accounted for 50% of HUS cases. Only in the Northwest District was a decline in the rate of reported HUS cases (0.1 per 100,000 population) observed, with a 33.3% decrease in the number of cases compared to the previous five -year median.

Missouri experienced a significant increase in the number of reported STEC and subsequently HUS cases in 2011. The increase in STEC cases was observed in all districts of the state. The increase of STEC associated illnesses was particularly high in the Eastern and Southwest districts with increases above the previous five year median of 114.5% and 100% respectively.

Table 2. Hemolytic Uremic Syndrome (HUS), Comparative Statistics, by Socio-demographic Category, Missouri[1] 2011

		Case Count 2011	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		20	100.00%	0.3	9	122.20%
Sex	Female	10	50.00%	0.3	6	66.70%
	Male	10	50.00%	0.3	3	233.30%
Race	Black	1	5.00%	0.1	1	0.00%
	Other	1	5.00%	0.6	0	N/A
	Unknown	2	10.00%	N/A	0	N/A
	White	16	80.00%	0.3	7	128.60%
Age Group	00 to <01	0	0.00%	0	0	0.00%
	01 to 04	11	55.00%	3.5	5	120.00%
	05 to 14	3	15.00%	0.4	3	0.00%
	15 to 24	0	0.00%	0	0	0.00%
	25 to 39	0	0.00%	0	0	0.00%
	40 to 64	5	25.00%	0.3	1	400.00%
	65 plus	1	5.00%	0.1	0	N/A
District	Central	4	20.00%	0.6	2	100.00%
	Eastern	7	35.00%	0.3	2	250.00%
	Northwest	2	10.00%	0.1	3	-33.30%
	Southeast	2	10.00%	0.4	2	0.00%
	Southwest	5	25.00%	0.5	2	150.00%

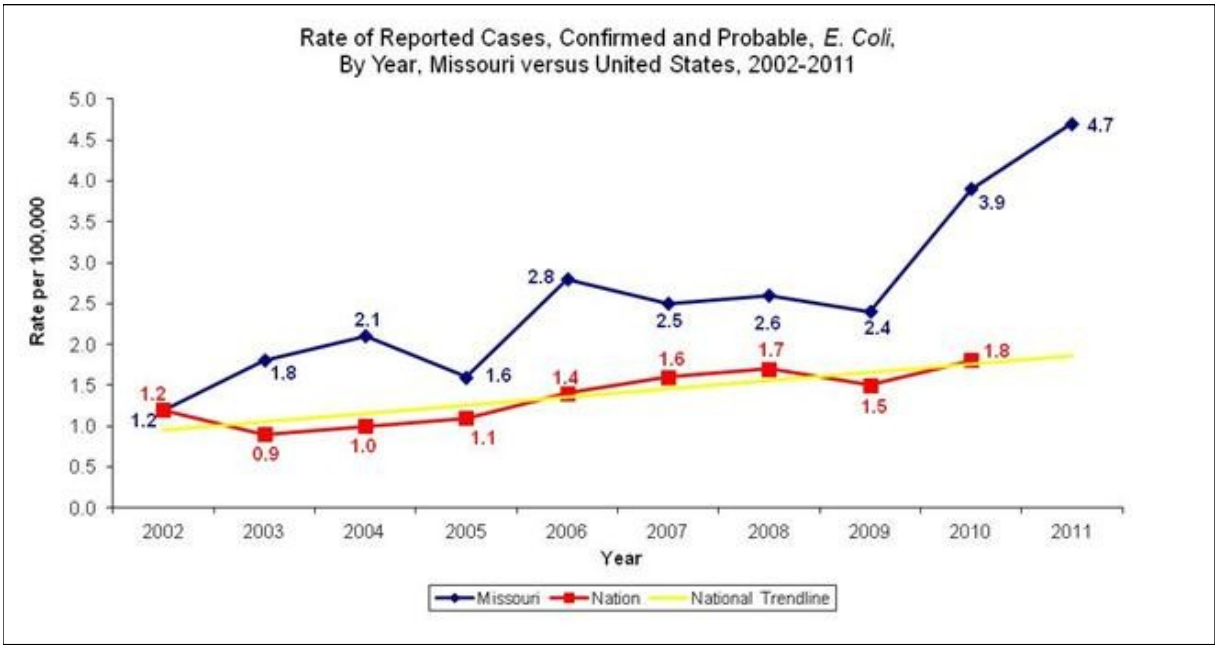
[1]Socio-demographics are missing for some cases.
*All rates are calculated per 100,000 using 2010 population estimates provided by MDHSS, Bureau of Health Informatics.

Three outbreaks of *E. Coli O157:H7* were reported in Missouri in 2011. The first two outbreaks occurred in day care centers located in the Central District in March, 2011 and in the Eastern District in September, 2011. A total of 9 cases were identified in association with the two outbreaks. The third outbreak investigation was begun in the Eastern District and evolved into a nationwide investigation. It was associated with consumption of contaminated romaine lettuce, grown out-of-state, but distributed in Missouri and heavily in the Eastern District. The third outbreak was significant in that it was identified by CDC as the fourth largest known *E. Coli 0157:H7* outbreak in U.S. history. Among Missouri residents, 42 confirmed cases were associated with the outbreak. Thirty-nine of the cases were from the Eastern District accounting for the overall increase in cases reported in the Eastern District.

Section A - Communicable Disease Surveillance

E. coli (all) and HUS - Continued

Comparison to National Data: During the years 2006 to 2010, the rate of STEC cases in Missouri has consistently exceeded the corresponding rate nationally. However, the rates for both have been gradually trending upward despite the slight decrease observed in 2009. Whether these trends represents an actual increase in the incidence of STEC cases or is a reflection of increased testing or changes in diagnostic strategies is unknown.



Illnesses caused by STEC are potentially severe and life-threatening and can result from exposures to many different possible sources. It is therefore critically important that cases continue to be promptly reported and potential sources investigated. Identifying the specific source of infection is often difficult particularly in the absence of an outbreak. The collection of accurate exposure information from the ill persons or their surrogates remains an integral component of public health surveillance.

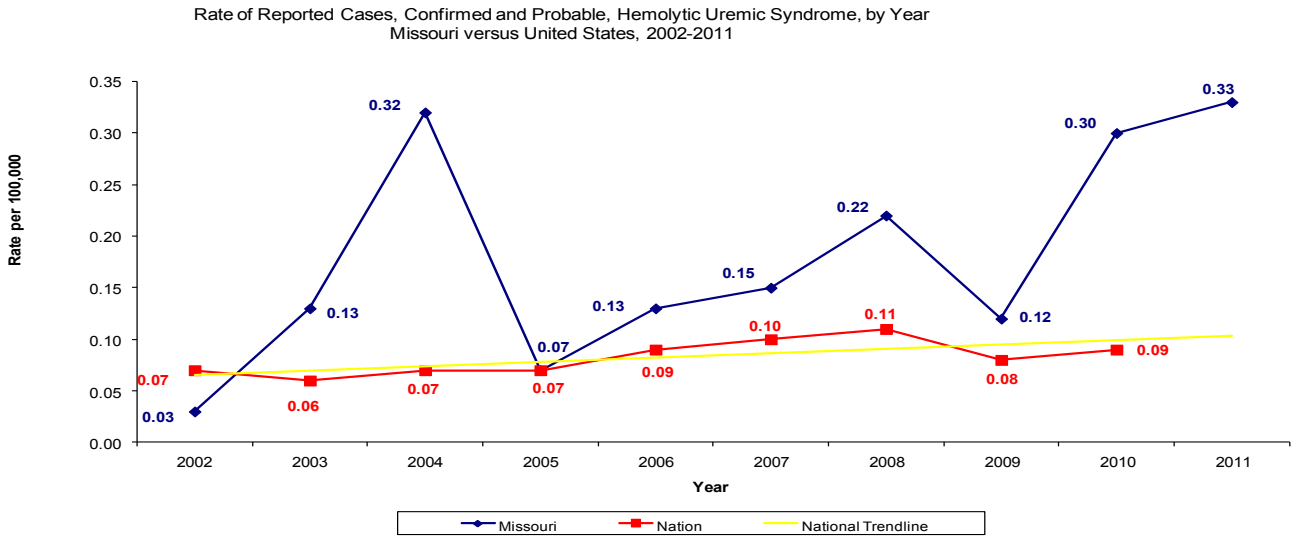
Outbreaks of STEC have been linked to a variety of exposures including undercooked ground beef, petting zoos, raw fruits and vegetables, unpasteurized dairy, and both recreational and drinking waters. With the increased risk of severe complications for children, it is critical for parents and guardians to implement preventive measures to reduce the risk of developing a STEC associated illness.

Section A - Communicable Disease Surveillance

E. coli (all) and HUS - Continued

Preventative measures for all ages include, but are not limited to:

- Washing hands thoroughly with warm water and soap after going to the toilet, before preparing foods, after preparing foods, and after touching animals.
- Safe handling and thorough cooking of meats, especially ground meat.
- Avoiding consumption of unpasteurized juice, milk or other dairy products.
- Washing fruits and vegetables - especially leafy greens.
- Washing cutlery and crockery - making sure knives, forks, plates and serving dishes are thoroughly washed with warm, soapy water.
- Storing foods separately and using separate cutting boards. Do not store raw ground beef right next to other foods.
- Avoiding swallowing or getting recreational water in your mouth.
- Private well owners should consider having their wells tested for the presence of *E. Coli* and other coliform bacteria. In addition, the integrity of the well head should be evaluated to avoid potential contamination with surface water that could introduce pathogens such as STEC into the drinking water.



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Section A - Communicable Disease Surveillance

Hepatitis B (infant) Perinatal

Hepatitis B is a contagious liver disease that results from infection with the Hepatitis B virus (HBV). It can range in severity from a mild illness lasting a few weeks to a serious, lifelong illness. Hepatitis B is usually spread when blood, semen, or another body fluid from a HBV infected person enters the body of someone who is not infected. This can happen through sexual contact with an infected person or sharing needles, syringes, or other drug-injection equipment. Hepatitis B can also be passed from an infected mother to her baby at birth.

HBV infection begins as an acute infection that can affect infants, children or adults. Many HBV infections go undetected as some infected persons may have no symptoms or symptoms may be mild and resolve without intervention.

Table 1. Hepatitis B (Infant) Perinatal
Comparative Statistics by Socio-demographic Category, Missouri 2011[1]

		Case Count	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		2	100.00%	0	0	N/A
Sex	Female	2	100.00%	0.1	0	N/A
	Male	0	0.00%	0	0	0.00%
Race	Black	0	0.00%	0	0	0.00%
	Other	1	50.00%	0.6	0	N/A
	White	1	50.00%	0	0	N/A
Age Group	00 to <01	0	0.00%	0	0	0.00%
	01 to 04	2	100.00%	0.6	0	N/A
	05 to 14	0	0.00%	0	0	0.00%
	15 to 24	0	0.00%	0	0	0.00%
	25 to 39	0	0.00%	0	0	0.00%
	40 to 64	0	0.00%	0	0	0.00%
	65 plus	0	0.00%	0	0	0.00%
District	Central	0	0.00%	0	0	0.00%
	Eastern	0	0.00%	0	0	0.00%
	Northwest	1	50.00%	0.1	0	N/A
	Southeast	1	50.00%	0.2	0	N/A
	Southwest	0	0.00%	0	0	0.00%

[1]Socio-demographic Category Information is missing for some cases. N/A=No computation made.
*All rates are calculated per 100,000 using 2010 population estimates provided by DHSS, Bureau of Health Informatics
Data Source: Missouri Health Information Surveillance System (WebSurv).

The presence of signs and symptoms varies by age. Most children under age 5 years and newly infected immunosuppressed adults are asymptomatic; whereas 30%–50% of persons aged ≥5 years have initial signs and symptoms. When present, signs and symptoms can include: fever, fatigue, loss of appetite, nausea, vomiting, abdominal pain, dark urine, clay-colored bowel movements, joint pain, and jaundice. Persons with chronic HBV infection might be asymptomatic, have no evidence of liver disease, or have a spectrum of disease ranging from chronic hepatitis to cirrhosis or hepatocellular carcinoma (a type of liver cancer).

In a pregnant woman, a HBV infection poses a serious risk to her infant at birth. Without post-exposure immunoprophylaxis (vaccination), approximately 40% of infants born to HBV-infected mothers in the United States will develop chronic HBV infection, approximately one-fourth of whom will eventually die from chronic liver disease.

Perinatal HBV transmission can be prevented by identifying HBV-infected (i.e., Hepatitis B surface antigen [HBsAg]-positive) pregnant women and providing Hepatitis B immune globulin and Hepatitis B vaccine to their infants within 12 hours of birth. A second dose of Hep B vaccine is given between 1-2 months of age, and a third is given at six months of age.

Section A - Communicable Disease Surveillance

Hepatitis B (infant) Perinatal - Continued

In Missouri, in 2011, there were two reported cases of Perinatal, Viral Hepatitis B. Both were females, between the ages of 1 and 4 years. One case was reported from the Northwest District and the other was from the Southeast District.

In Missouri, more than 350 new cases of hepatitis B have been reported each year since 2005. Hepatitis B continues to be transmitted despite rigorous immunization practices. However the number of newly diagnosed infections has dramatically decreased since 1991 when the hepatitis B vaccine was added to the recommended routine vaccination schedule for children.

Comparison to National Data: According to CDC, an estimated 350 million persons are infected with HBV. HBV infection is a global problem of which 620,000 people worldwide die from each year because of commonly associated HBV-related and progressive liver disease including cirrhosis, hepatic carcinoma, and hepatic failure. Although the number of new infections has declined considerably from an estimated 208,000 new HBV cases in 1980 to an estimated 38,000 in 2009, there continues to be an estimated 1.4 million chronically HBV-infected persons in the United States.

Preventing perinatal HBV transmission is an integral part of the national strategy to eliminate Hepatitis B in the United States. National guidelines call for the following:

- Universal screening of pregnant women for HBsAg during each pregnancy;
- Case management of HBsAg-positive mothers and their infants;
- Provision of immunoprophylaxis for infants born to infected mothers, including Hepatitis B vaccine and Hepatitis B immune globulin; and
- Routine vaccination of all infants with the Hepatitis B vaccine series, with the first dose administered at birth.

In 2005, the Missouri Viral Hepatitis Prevention Program teamed up with the Perinatal Hepatitis B Case Management Program to provide hepatitis education to the health care providers. As a result, Missouri has a very low incidence of Perinatal Hepatitis B (see Table 1).

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Influenza

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Influenza (the flu) is a contagious respiratory illness caused by influenza viruses. It can cause mild to severe illness, and at times can lead to death. There are three types of human influenza viruses, types A, B and C, with influenza A viruses being the most severe. Influenza is characterized by abrupt onset of fever, often with chills or rigors, headache, malaise, diffuse myalgia, and nonproductive cough. Subsequently, as symptoms progress, sore throat, nasal congestion, rhinitis, and cough become more prominent.

Table 1. Influenza Season-to-Date and 5-season Median by Influenza Type

Influenza Type	2011-2012 Season	% of Total	5-Season Median	% Change from 5-Season Median
Influenza A	18,752	91.59%	10,543	77.9%
Influenza B	977	4.77%	3,845	(74.6%)
Influenza Unknown Or Untyped	745	3.64%	2,561	(70.9%)
Total	20,474	100%	17,776	15.2%

Influenza affects the health of a large number of people every year. Most people recover within a week, but a cough and tiredness can linger for two weeks or longer. Dehydration, bronchitis, and bacterial pneumonia, are some of the complications from flu. The flu can make chronic health problems worse. For example, people with asthma may experience asthma attacks while they have the flu, and people with chronic congestive heart failure may have worsening of this condition triggered by the flu. Children may get sinus problems and ear infections as complications from the flu. Persons 65 years and older, children under the age of two, and persons of any age with chronic medical conditions are at highest risk for serious complications of flu. In the U.S., influenza and pneumonia combined are among the top 10 leading causes of death. On average, in the U.S., influenza is annually associated with more than 36,000 deaths and more than 200,000 hospitalizations. In Missouri, influenza and pneumonia are associated with approximately 1,500-3,000 deaths per year. In addition to the loss of life associated with influenza, the economic impact is staggering. Studies have shown that in an average year, direct and indirect medical costs associated with the flu in the U.S. is in the billions of dollars.

Table 2. Influenza Season-to-Date and 5-season Median by Age Group

Age Group	Count	% of Total	5-Season Median	% Change from 5-Season Median
00-<02	1,863	9.1%	1,705	9.3%
02-04	3,476	17%	2,503	38.9%
05-14	6,996	34.17%	6,478	8.0%
15-24	1,687	8.24%	2,669	(36.8%)
25-49	3,487	17.03%	3,520	(0.9%)
50-64	1,344	6.56%	1,026	31.0%
65+	1,621	7.92%	360	350.3%
Total	20,474	100%	17,776	15.2%

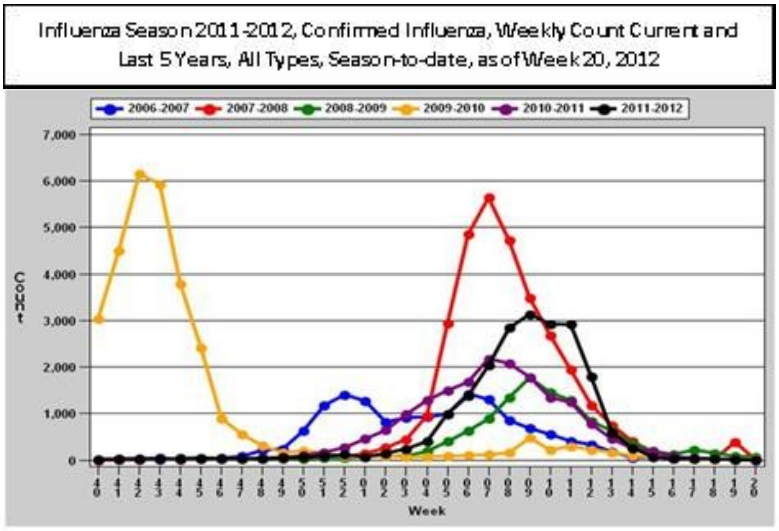
Table 3. Influenza Season-to-Date and 5-season Median by District

District	Count	% of Total	Rate per 100,000	5-Season Median	% Change from 5-Season Median
Central	4,069	19.87%	610.70	1,877	11.6%
Eastern	6,051	29.55%	271.32	4,939	22.5%
Northwest	6,459	31.53%	412.28	4,504	43.5%
Southeast	1,398	6.83%	294.35	2,126	(34.2%)
Southwest	2,497	12.20%	237.63	3,767	(33.7%)
State	20,474	100%	341.86	17,776	15.2%

Section A - Communicable Disease Surveillance

Influenza - Continued

The influenza season is defined as the period between week 40 (usually the first week of October) of one year and week 20 (around mid -May) of the next. The 2011-2012 season began September 30, 2011, and ended May 19, 2012.



During the 2011-2012 season, 20,474 influenza cases were reported in Missouri, for a rate of 341.9 cases per 100,000 population. There were 18,752 type A (91.6%), 977 type B (4.77%), and 745 unknown or untyped (3.64%).

The influenza total presented each year does not reflect the actual number of influenza cases in the state. These counts are the number of patients who have been tested by a health care provider, have had a positive flu test, and were reported to public health. Influenza can cause mild to severe illness. Most individuals with mild illness do not seek medical attention or go to a doctor. Those who are ill enough to go to a doctor are not always tested.

During the 2011-2012 season, approximately 60.2% of all reported cases were <15 years of age. The age group of 15-24 and 25-49, accounted for 25.3%. Those 50 years or above accounted for 14.5 % of all cases in Missouri.

There were 14 outbreaks and 14 school closures reported during the 2011-2012 season. The Central District had the highest rate per 100,000 population with 610.70 or 4,069 cases.

Comparison to National Data: Individual cases of influenza are not a nationally notifiable disease; therefore, comparison to national data cannot be done. However, data from the weekly percentage of outpatient visits for ILI, as reported by the U.S. Outpatient ILI Surveillance Network (ILINet), is comparable. Nationally, the weekly percentage of outpatient visits for ILI met, but did not exceed, the national baseline level of 2.4% for one week (week ending March 17, 2012) during the 2011-12 influenza season. In Missouri, the weekly percentage of outpatient visits for ILI was above the national baseline for 10 weeks, from week ending January 14, 2012, through week ending March 17, 2012, peaking during the week ending February 18, 2012 at 6.84%.

Influenza-associated pediatric deaths are a nationally notifiable disease. A total of 34 influenza-associated pediatric deaths were reported nationally during the 2011-2012 season. Nationally, this is the lowest

Section A - Communicable Disease Surveillance

Influenza - Continued.

number of pediatric deaths reported during a season since such record-keeping began. These are deaths in children younger than 18 who test positive for influenza. There was one reported influenza-associated pediatric death in Missouri during the 2011-2012 season; a five year old male from the Southwest District.

In comparison to other seasons, the 2011-2012 season set a new record for the lowest and shortest peak of influenza-like illness. The season began late and was mild compared to most previous seasons for which surveillance data is available. Flu seasons are unpredictable when they begin, how severe they are, how long they last, which viruses will spread, and whether the viruses in the vaccine match flu viruses that are circulating.

During the 2011-2012 season, influenza A (H3N2), 2009 influenza A (H1N1), and influenza B viruses co-circulated in the United States. Over the course of the season, predominant viruses varied from region to region and between states, but nationally, influenza A (H3N2) influenza viruses predominated. Most of the viruses tested that season were well matched to the vaccine viruses. The seasonal trivalent vaccine for 2011 -2012 contained the same three components as the 2010-2011 vaccine. These are an A/California/7/2009 (H1N1)-like virus, an A/Perth/16/2009 (H3N2)-like virus, and a B/Brisbane/60/2008-like virus (B Victoria lineage).

Receiving the influenza vaccine each year is the best protection against getting the flu. Practicing good health habits can help stop the spread of germs and prevent respiratory illnesses like the flu. These include:

- **Avoid close contact.** Avoid close contact with people who are sick. When you are sick, keep your distance from others to protect them from getting sick too.
- **Stay home when you are sick.** If possible, stay home from work, school, and errands when you are sick. You will help prevent others from catching your illness.
- **Cover your mouth and nose.** Cover your mouth and nose with a tissue when coughing or sneezing. It may prevent those around you from getting sick.
- **Clean your hands.** Washing your hands often will help protect you from germs. If soap and water are not available, use an alcohol-based hand rub.
- **Avoid touching your eyes, nose or mouth.** Germs are often spread when a person touches something that is contaminated with germs and then touches his or her eyes, nose, or mouth.
- **Practice other good health habits.** Get plenty of sleep, be physically active, manage your stress, drink plenty of fluids, and eat nutritious food.

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Section A - Communicable Disease Surveillance

Listeriosis

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Listeriosis is a relatively uncommon but severe invasive infection caused by *Listeria monocytogenes*. *Listeria* infection is usually caused by eating food contaminated with the bacterium. *Listeria* is also capable of thriving in soil, water, silage, domestic and wild animals, and even humans.

Table 1. Listeriosis, Comparative Statistics by Socio-demographic Category, Missouri 2011[1]

		Case Count	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		22	100.00%	0.4	12	83.30%
Sex	Female	6	27.30%	0.2	6	0.00%
	Male	16	72.70%	0.5	6	166.70%
Race	Black	2	9.10%	0.3	1	100.00%
	Other	2	9.10%	1.3	0	N/A
	Unknown	1	4.50%	N/A	2	-50.00%
	White	17	77.30%	0.3	7	142.90%
Age Group	00 to <01	1	4.50%	1.3	2	-50.00%
	01 to 04	0	0.00%	0	0	0.00%
	05 to 14	0	0.00%	0	0	0.00%
	15 to 24	1	4.50%	0.1	1	0.00%
	25 to 39	1	4.50%	0.1	1	0.00%
	40 to 64	4	18.20%	0.2	2	100.00%
	65 plus	15	68.20%	1.8	5	200.00%
District	Central	1	4.50%	0.2	1	0.00%
	Eastern	7	31.80%	0.3	5	40.00%
	Northwest	8	36.40%	0.5	3	166.70%
	Southeast	2	9.10%	0.4	1	100.00%
	Southwest	4	18.20%	0.4	1	300.00%

[1]Socio-demographic Category Information is missing for some cases. N/A=No computation made.

*All rates are calculated per 100,000 using 2010 population estimates provided by DHSS, Bureau of Health Informatics

Data Source: Missouri Health Information Surveillance System (WebSurv).

The symptoms of *listeria* typically develop within 3 to 70 days (median 21 days) following exposure. The symptoms and severity of disease are often variable and dependent on the person infected. High-risk persons (other than pregnant women) can experience symptoms such as fever, muscle aches, headache, stiff neck, confusion, loss of balance, and convulsions. Pregnant women typically experience only a mild, influenza-like illness. However, infection during pregnancy can lead to miscarriage, stillbirth, premature delivery, or life-threatening infection of the newborn. Healthy persons occasionally develop invasive *listeria*. In addition, persons exposed to a very large dose of *listeria* bacteria can develop a non-invasive illness with diarrhea and fever.

Listeria bacteria can get into a food processing facilities and contaminate food products. The bacterium has been found in a variety of raw foods, such as uncooked meats and vegetables, as well as in foods that become contaminated after cooking or processing, such as soft cheeses, processed meats such as hot dogs and deli meat (both products in factory-sealed packages and products sold at deli counters), and smoked seafood. Unpasteurized (raw) milk and cheeses and other foods made from unpasteurized milk can contain the bacterium. *Listeria* is killed by pasteurization and cooking; however, in some ready-to-eat foods, such as hot dogs and deli meats, contamination may occur after factory cooking but before packaging. Unlike most bacteria, *listeria* can grow and multiply in foods stored in refrigeration.

Section A - Communicable Disease Surveillance

Listeriosis - continued.

Statewide in 2011, there were 22 cases of *listeria* reported. This is an 83.3% increase when compared to the 5-year median. Males accounted for 72.7% of the cases. The age group of 65 years or older accounted for 68.2% of the cases. The overall incidence rate was 0.4 per 100,000 for 2011. For the years of 2008 to 2010, the incidence rates in Missouri had remained the same at 0.2 per 100,000 population. In 2011, the incidence rate rose above the historic level for the past 10 years. Missouri's rate is higher than the national trend for 2010.

The increase in cases, in part, resulted from a multistate outbreak of *listeria* associated with cantaloupe which was detected in September, 2011. Nationwide, a total of 147 cases from 28 states matched five different pulsed-field gel electrophoresis (PFGE) patterns identified with this outbreak. There were 33 deaths reported nationwide. For Missouri, seven cases were reported that matched this outbreak. Death attributed to *listeria* was reported in three of the cases.

Comparison to National Data: Nationally, reported cases of *listeria* have remained the same for the time period of 2005 to 2010. National data for 2011 is not available; however, with the multistate outbreak the national numbers may trend up for the year.

Listeriosis was added to the list of nationally notifiable diseases in 2001. To improve surveillance, the Council of State and Territorial Epidemiologists recommended that all *L. monocytogenes* isolates be forwarded to the state public health laboratories for subtyping. The MSPHL sends all *listeria* isolates to CDC for molecular subtyping by PFGE. In 2005, CDC established a nationwide *Listeria* Initiative which is an enhanced surveillance system that aids in investigations of listeriosis outbreaks and clusters. LPHAs interview patients using the *Listeria* Case Report, a standardized questionnaire developed to collect detailed information about food exposures.

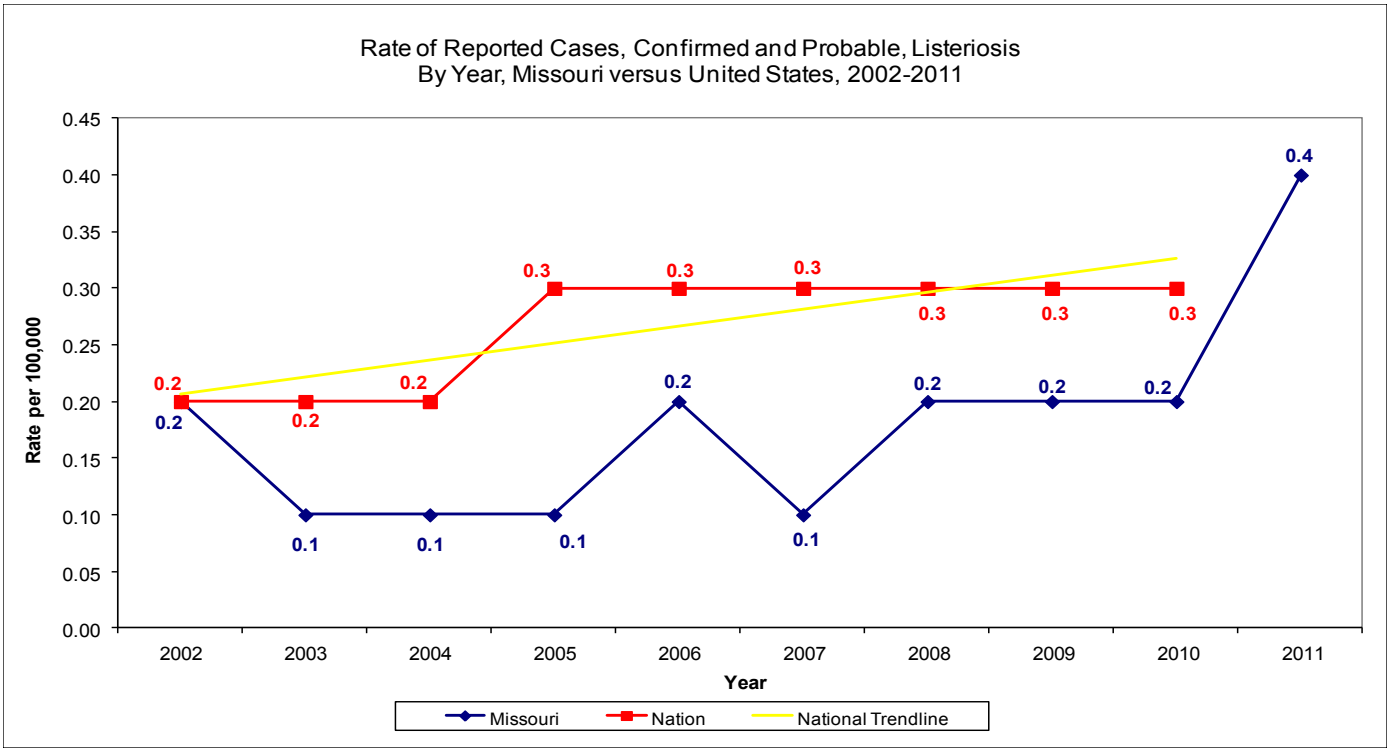
The Initiative for 2010 provides the following data. The median age of patients was 72 years for non-pregnancy-associated cases and 28 years for pregnancy-associated cases. Hispanic ethnicity was substantially more common in patients with pregnancy-associated cases (43%) than with non-pregnancy associated cases (13%). Twenty percent of patients with non-pregnancy associated cases died. Nineteen percent of pregnancy-associated cases led to fetal death; 6% of live-born infants with cases of listeriosis died.

Although most listeriosis cases are sporadic (i.e., not associated with a recognized cluster of illness), the detection of a listeriosis cluster/outbreak is a critical opportunity to prevent additional illness and death by removing the contaminated product from the food supply. Outbreak investigations often provide information that can be used to improve food safety. Epidemiologic investigations of listeriosis clusters can be challenging because they are typically detected as a small number of geographically dispersed case-patients (some of whom may have died), and the incubation period can be lengthy, making patients' recall of food exposures difficult.

Section A - Communicable Disease Surveillance

Listeriosis - continued.

The general guidelines recommended for the prevention of listeriosis are similar to those used to help prevent other foodborne illnesses, such as salmonellosis. In addition, there are specific recommendations for persons at higher risk for listeriosis, such as pregnant women and immune compromised individuals. A complete list is available on CDC's website: http://www.cdc.gov/listeria/prevention.html



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CDC Health Topics

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Health Districts Defined

Section A - Communicable Disease Surveillance

Malaria

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Malaria is a parasitic disease caused by infection of one (or more) of four species of *Plasmodium* (*P.*): *P. falciparum*, *P. vivax*, *P. ovale*, and *P. malariae*. *P. falciparum* and *P. vivax* infections are the most common worldwide, with *P. falciparum* representing the most serious public health threat because of its tendency toward severe or fatal infections. Malaria is endemic throughout the tropical areas of the world and is still a major cause of illness, and among the leading causes of death from infectious diseases in some sub-tropical areas of the world. Most malarial disease is transmitted to humans through the bite of an infected female nocturnal-feeding *Anopheles* mosquito. The World Health Organization estimates in 2010 there were 216 million malaria cases, and approximately 655,000 malaria-related deaths. Most deaths occur in young children. There is also a substantial risk to pregnant women and their fetuses, often resulting in spontaneous abortions or stillbirths.

Table 1. Malaria
Comparative Statistics by Socio-demographic Category, Missouri 2011[1]

		Case Count	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		21	100.00%	0.4	14	50.00%
Sex	Female	7	33.30%	0.2	6	16.70%
	Male	14	66.70%	0.5	8	75.00%
Race	Black	9	42.90%	1.2	4	125.00%
	Other	2	9.50%	1.3	1	100.00%
	Unknown	2	9.50%	N/A	2	0.00%
	White	8	38.10%	0.2	2	300.00%
Age Group	00 to <01	0	0.00%	0	0	0.00%
	01 to 04	1	4.80%	0.3	0	N/A
	05 to 14	0	0.00%	0	0	0.00%
	15 to 24	6	28.60%	0.7	3	100.00%
	25 to 39	4	19.00%	0.3	6	-33.30%
	40 to 64	9	42.90%	0.5	2	350.00%
	65 plus	0	0.00%	0	0	0.00%
	Unknown	1	4.80%	N/A	0	N/A
District	Central	2	9.50%	0.3	1	100.00%
	Eastern	10	47.60%	0.4	5	100.00%
	Northwest	8	38.10%	0.5	6	33.30%
	Southeast	0	0.00%	0	1	-100.00%
	Southwest	1	4.80%	0.1	0	N/A

[1]Socio-demographic Category Information is missing for some cases. N/A=No computation made.
*All rates are calculated per 100,000 using 2010 population estimates provided by DHSS, Bureau of Health Informatics
Data Source: Missouri Health Information Surveillance System (WebSurv).

The classic early symptoms of malaria are high fever, chills, rigor, sweats and headache, which may be paroxysmal. If appropriate treatment is not administrated, fever and paroxysms may occur in a cyclic pattern every other to every third day depending on the infecting species. Other symptoms include nausea, vomiting, diarrhea, cough, tachypnea, arthralgia, myalgia, abdominal and back pain, anemia, thrombocytopenia, jaundice and hepatosplenomegaly. If left untreated infection with *P. falciparum* is potentially fatal. *P. vivax* and *P. ovale* may develop into anemia or hypersplenism with danger of late splenic rupture and may relapse for as long as three to five years after the primary infection. Congenital malaria secondary to perinatal transmission is rare but does sometimes occur. Incubation periods range from 9 to 40 days depending on the malarial species. Some strains of *P. vivax* can have an incubation period as long as 6 to 12 months.

Missouri experienced a significant increase in the number of reported Malaria cases in 2011 (21 cases), which was a 50% increase in the number of cases compared to the five-year median data from 2006-2010. The incident rate for the year was 0.4 cases per 100,000 population. The cases range from 1 year to 64

Section A - Communicable Disease Surveillance

Malaria - Continued.

years of age with the highest percent being reported among persons aged 40 to 64 years. Sixty-seven percent of the cases were male and the race specific rates were 1.3 among "other" races, 1.2 among blacks, and 0.2 among whites.

The increase in cases was observed primarily in the Eastern and Northwestern districts of the state, with 47.6% of the cases being reported in the Eastern District and 38.1 % in the Northwest District. Both of these districts contain major metropolitan areas. All of the cases of malaria reported in Missouri whose travel history was known had traveled to countries known to be endemic for malaria.

Comparison to National data: The World Health Organization estimates that in 2010 there were 216 million malaria cases, and approximately 655,000 malaria-related deaths. Most deaths occur in young children. In 2010, the national rate per 100,000 population was approximately 0.56, while the state had a rate of 0.4 per 100,000 population in 2011. The increase in the annual incidence rate of malaria cases in Missouri, from 2009 through 2011, was a greater rate increase than observed nationally. Despite the increase in reported malaria cases in 2011, the incidence rate for reported malaria cases in Missouri remains below the national rate. While the Missouri rates have continued to fluctuate over the past five years, they have consistently remained below the national rate.

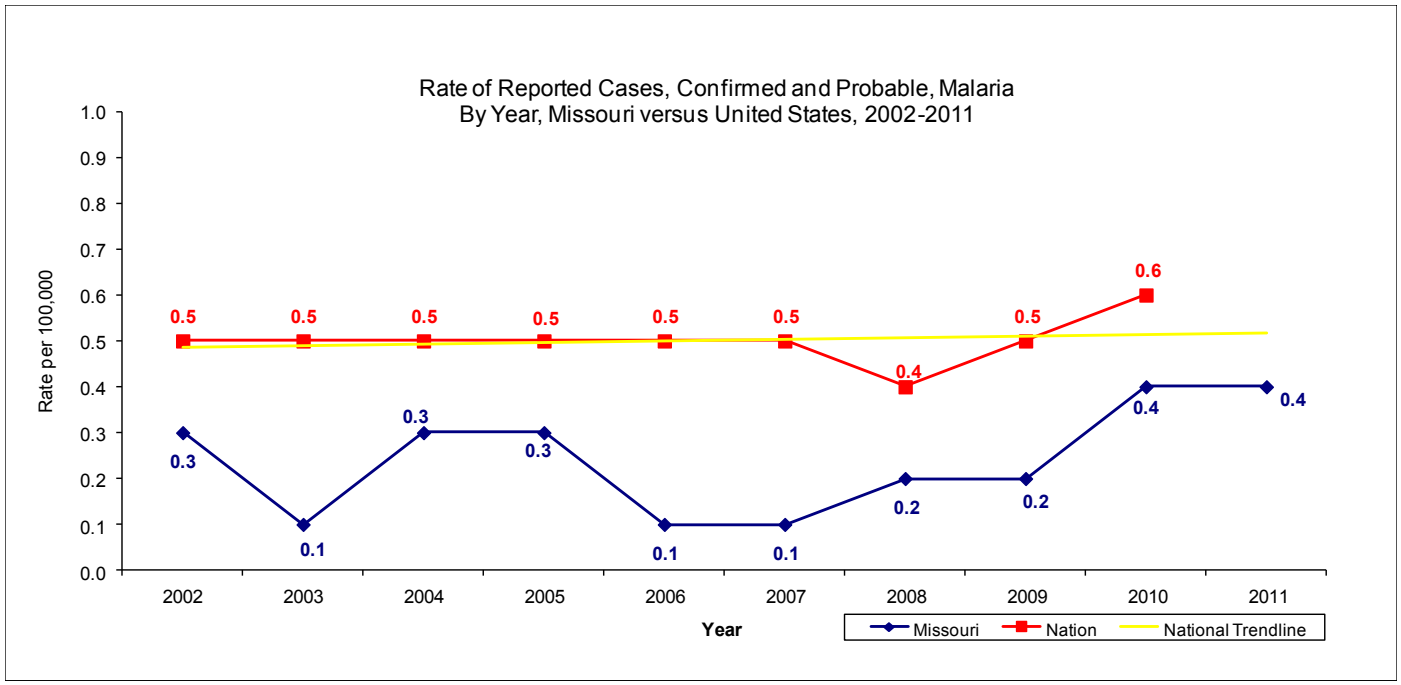
The CDC reports nearly all of the malaria cases in the United States in 2010 resulted from infections acquired in travelers and immigrants returning from countries where malaria is endemic. Preventative medication or chemoprophylaxis is available and is determined by the areas that the travelers will be visiting, the type of malaria that is prevalent in that area, and the travelers' risk of exposure to malaria that is resistant to particular medications. Travelers should begin their chemoprophylaxis early enough prior to their departure date that their physician can determine if they have an adverse reaction to that medication and can be started on an alternative regimen prior to departure. More than 80% of 2010 cases reported in the United States did not follow a CDC-recommended prophylaxis regimen.

Malaria is an illness that is usually preventable for travelers. Missouri residents planning a trip to an area were malaria may be endemic should review the current guidance available from CDC at http://www.cdc.gov/malaria/ with their medical providers and determine the need for an appropriate chemoprophylaxis regimen.

In addition, blood and organ donors should be questioned for a history of malaria, or a history of travel to or residence in a malarious area to prevent induced malaria. Induced malaria refers to infection that is passed directly from one individual to another through contaminated blood or blood products, injection equipment, or organ transplant.

Section A - Communicable Disease Surveillance

Malaria - Continued.



Additional Website Resources

CDC Health Topics

CDIRM

Health Districts Defined

Section A - Communicable Disease Surveillance

Rabies, Animal and Human
Rabies Post-Exposure Prophylaxis (PEP) Initiated

All Species Map
Wild Species Map
Domesticated Species Map
PEP Map

Rabies is a fatal viral illness that affects only mammals. Although there is great variability in the susceptibility of various species to infection with this virus and subsequent manifestation of disease, any mammal may be infected with the rabies virus and serve as a source of infection for other mammals. The virus is typically present in the saliva of clinically ill mammals and is most often transmitted through a bite. After entering the central nervous system of the next host, the virus causes an acute, invariably progressive encephalomyelitis that is almost always fatal. The incubation period in animals and humans is usually several weeks to months, but may range from days to years. Rabies has the highest case fatality ratio of any infectious disease if prompt intervention is not initiated in the case of humans; there is no postexposure intervention for animals. Laboratory testing for rabies is useful for confirmation of the virus' presence in certain species and geographic locations, and for determination of the need to administer rabies prophylaxis in cases of human exposure to a potentially rabid animal. The only reliable method of testing animals for the presence of rabies virus is through laboratory analysis of brain tissue. Public health surveillance for this disease in domestic and wild animal populations is a valuable tool in the prevention of human rabies cases.

Table 1. Animal Rabies, by Species, Missouri 2011

Species	Number Examined	Number Positive	Percent Positive
Bat	569	16	2.80%
Cat	474	0	0.00%
Cow	22	0	0.00%
Dog	568	0	0.00%
Ferret	1	0	0.00%
Fox	5	0	0.00%
Horse	15	0	0.00%
Other Domestic	10	0	0.00%
Other Wild	28	0	0.00%
Raccoon	85	0	0.00%
Rodent/Rabbit	59	0	0.00%
Skunk	32	13	40.60%
Total	**1,868**	**29**	**1.60%**

Rabies (Animal)

During 2011, 29 cases of animal rabies (16 bats and 13 skunks) were detected in Missouri, compared to 63 cases the previous year, representing a 54% decrease. This sharp drop was in part the result of fewer specimen submissions due to increased emphasis on ensuring that specimens were submitted only when there was a public health or medical reason to do so (rather than, for example, submission of specimens for purely surveillance purposes). This approach helped to ensure the effective utilization of laboratory resources. The drop from 2010 to 2011 was also due to a decrease in the percent of specimens that tested positive from one year to the next. The number of specimens tested in 2011 was 1,868, with 29 found positive, giving a positivity rate of 1.6%. In 2010, 63 of 2,590 submitted specimens tested positive, yielding a 2.4% positivity rate. The annual number of rabies cases during the preceding ten years (2001-2010) ranged from a low of 38 cases in 2007 to a high of 73 cases in 2005. The median number of cases per year during this time period was 61.

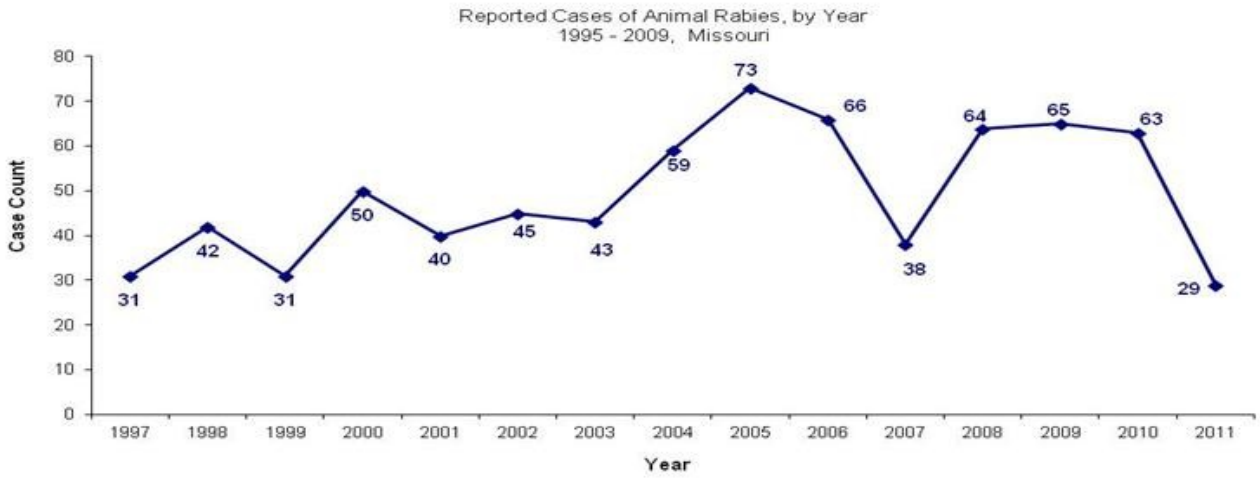
Section A - Communicable Disease Surveillance

Rabies, Animal and Human; Rabies Post-Exposure Prophylaxis (PEP) Initiated - Continued

of agencies and individuals to submit specimens for testing, competing interests, financial constraints and, of course, the actual incidence of rabies in wildlife. As with most diseases having wild animals as the reservoir, the number of rabies cases goes through a cycle of "troughs" and "peaks" over a period of several years. Peaks usually correspond to the infection of large numbers of immunologically naïve animals that result when populations increase due to favorable environmental conditions, decreased human intervention (hunting, trapping, eradicating), and other factors. Troughs result as transmission rates decrease among rabies die-off survivors, which tend to have a wider degree of geographic dispersion and perhaps some level of immunity. Survivors eventually reproduce, providing a new population of vulnerable animals through which the rabies virus can spread and which results in the next peak of the cycle. As the number of rabid reservoir animals (which are bats and skunks, in Missouri) increases, so does the chance of "spill-over" into other species, both wild and domestic. Presumably, the percentage of animals that test positive for rabies increases as the natural incidence increases (and vice versa), but there is little predictive value to this relationship since the exact correlation cannot be determined with existing data.

The SPHL is the only facility in Missouri that tests animals for rabies. Specimens are tested only when there is known exposure or "significant potential exposure" of any of the following to a possibly infected animal: humans, pets, domesticated animals (e.g., horses, livestock), exotic or non-native animal species maintained for husbandry purposes or in zoos. For more details regarding criteria for submission of rabies specimens (including the definition of "significant potential exposure"), refer to the rabies testing policy letter at http://health.mo.gov/lab/pdf/rabies_testing_policy.pdf.

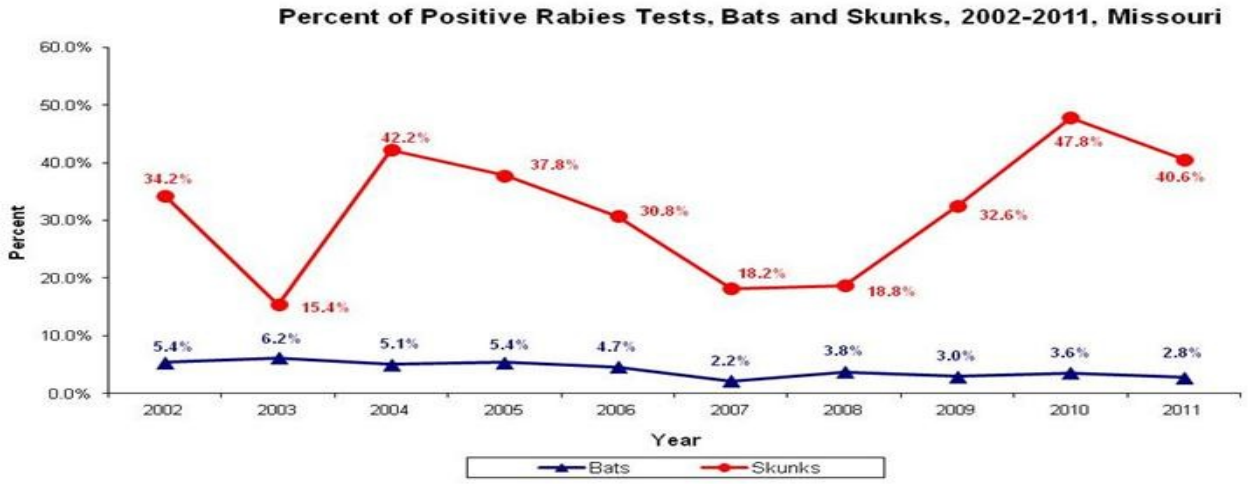
In 2011, specimens were submitted from all regions of the state, with rabid animals detected in 14 counties. The first rabid animal detected was a skunk from Howell County on March 14th, while the last animal was detected on December 15th, a skunk from Reynolds County. The months with the highest number of cases were July (5), with three counties detecting a total of 5 bats; and in September (5) with five counties detecting a total of 3 bats and 2 skunks.



Section A - Communicable Disease Surveillance

Rabies, Animal and Human; Rabies Post-Exposure Prophylaxis (PEP) Initiated - Continued

Rabies in bats occurs sporadically throughout Missouri. It is estimated that less than 0.5 percent of the bats in the wild are rabid, and only 2.8 percent of the "high risk" bats (e.g., found sick, dead, or exhibiting unusual behavior) tested positive during 2011. The big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), and the tri-colored bat (*Perimyotis subflavus*) account for about 95 percent of the species of bats found to be rabid in Missouri. Note: The tri-colored bat was formerly known as the eastern pipistrelle bat. While rabid skunks can be found anywhere in the state, most cases are usually confined to roughly the southern one-half of Missouri. Both the north-central and south-central variants of the skunk rabies virus are found in rabid skunks in Missouri. The percent of skunks that test positive for rabies is much more variable than the percent of bats testing positive, with evidence of rabies infection found in 40.6 percent of the skunks submitted in 2011. A county is placed under a "rabies alert" when a positive domestic animal is detected in that county or when the threshold level for rabid wild animals is exceeded. One county was placed under alert in 2011: Buchanan County (August) due to an unusually high number of rabid bats. Alerts routinely last for three months, but can be extended if additional rabid wild/domestic animals are detected during that time.



Rabies (Human)

No human rabies deaths were recorded in Missouri in 2011. The last known human death from rabies in this state (2008) involved a man who was bitten by a bat and, although aware of the bite, did not seek medical care or report the incident to public health officials until he was symptomatic. A complete description of this case can be found in the *Morbidity and Mortality Weekly Report*, Centers for Disease Control and Prevention, Vol. 58/No. 43/November 6, 2009 (http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5843a3.htm).

Section A - Communicable Disease Surveillance

Rabies, Animal and Human; Rabies Post-Exposure Prophylaxis (PEP) Initiated - Continued

Rabies Postexposure Prophylaxis (Initiated)

"Rabies postexposure prophylaxis (initiated)" (RPEP), became a reportable condition on August 31, 2006. This condition was reported 345 times during 2011, which was almost 49 percent above the five-year median of 232 reports. Males accounted for 183 (53%) of the 345 reports while females accounted for 162 (47%) of the reports. The number of reports and percent by age group were as follows: less than 1 year – 3 (0.9%); 1 to 4 years – 27 (7.8%); 5 to 14 years – 63 (18.3%); 15 to 24 years – 51 (14.8%); 25 to 39 years – 74 (21.4%); 40 to 64 years – 103 (29.9%); 65 plus years – 21 (6.1%); age unknown – 3 (0.9%). CDC estimates that about 40,000 persons receive RPEP in the United States each year. The expense of providing RPEP remains high and variable, with an estimated average cost of more than $5,000 per patient.

Table 2. Rabies Post Exposure Prophylasis Comparative Statistic Category, Missouri 20111

		Case Count	% of Total	Rate per 100,000
State of Missouri		345	100.00%	5.8
Sex	Female	162	47.00%	5.3
	Male	183	53.00%	6.2
Race	Black	11	3.20%	1.5
	Other	7	2.00%	4.5
	Unknown	66	19.10%	N/A
	White	261	75.70%	5.1
Age Group	00 to <01	3	0.90%	3.9
	01 to 04	27	7.80%	8.6
	05 to 14	63	18.30%	8
	15 to 24	51	14.80%	6.1
	25 to 39	74	21.40%	6.5
	40 to 64	103	29.90%	5.2
	65 plus	21	6.10%	2.5
	Unknown	3	0.90%	N/A

Administration of RPEP is a medical urgency, not a medical emergency. Physicians should evaluate each possible exposure to rabies and, if necessary, consult with local or state public health officials regarding the need for rabies prophylaxis. Factors that should be considered before specific antirabies postexposure prophylaxis is initiated include type of exposure (bite, nonbite), epidemiology of rabies in animal species involved, circumstances of bite incident, vaccination status of exposing animal, and availability of animal for quarantine or testing.

If exposed to rabies, previously vaccinated persons should receive two intramuscular doses (1.0 ml each) of vaccine, one immediately and one three days later. Previously vaccinated persons are those who have received one of the recommended preexposure or postexposure regimens of cell tissue culture vaccine, or those who received another vaccine and had a documented rabies antibody titer. Human rabies immunoglobulin (RIG) is unnecessary and should not be administered to these persons because the administration of passive antibody might inhibit the relative strength or rapidity of an expected anamnestic response.

Persons who have not been previously vaccinated should receive both vaccine and RIG. The combination of RIG and vaccine is recommended for both bite and nonbite exposures, regardless of the interval between exposure and initiation of treatment. A regimen of four 1-ml doses of vaccine should be administered intramuscularly. The first dose of the four-dose course should be administered as soon as possible after exposure (day 0). Additional doses should be administered on days 3, 7, and 14 after the first vaccination.

Section A - Communicable Disease Surveillance

Rabies, Animal and Human; Rabies Post-Exposure Prophylaxis (PEP) Initiated - Continued

Immunosuppressed individuals should receive a fifth dose of vaccine on day 28, with the awareness that the immune response may still be inadequate. A patient who fails to develop an antibody response should be managed in consultation with their physician and appropriate public health officials. As noted above, in addition to bite exposures, RIG is indicated for non-bite exposures, such as saliva from an infectious animal that is splashed into a person's eyes, nose, or mouth or which comes in contact with a fresh open cut, abrasion, or other wound. RIG is also indicated in those situations where a bite from an infected animal may not be apparent but is presumed to have occurred (such as a possible bite from a rabid bat) and for which RPEP is being administered. RIG is administered only once (i.e., at the beginning of RPEP) to previously unvaccinated persons to provide immediate, passive, rabies virus neutralizing antibody coverage until the patient responds to rabies vaccination by actively producing antibodies. If RIG was not administered when vaccination was begun (i.e., day 0), it can be administered up to and including day seven of the RPEP series. Beyond the seventh day, RIG is not indicated because an antibody response to rabies vaccine is presumed to have occurred. Because RIG can partially suppress active production of antibody, the dose administered should not exceed the recommended dose. The recommended dose of RIG is 20 IU/kg (0.133 mL/kg) body weight. This formula is applicable to all age groups, including children. If anatomically feasible, the full dose of RIG should be thoroughly infiltrated in the area around and into the wounds. Any remaining volume should be injected intramuscularly at a site distant from vaccine administration. This recommendation for RIG administration is based on reports of rare failures of RPEP when less than the full amount of RIG was infiltrated at the exposure site. RIG should never be administered in the same syringe or in the same anatomical site as the first vaccine dose. However, subsequent doses of vaccine in the 4-dose series can be administered in the same anatomic location where the RIG dose was administered, if this is the preferable site for vaccine administration (i.e., deltoid for adults or anterolateral thigh for infants and small children).

The following measures should be employed to help prevent rabies in the community:

- Ensure dogs, cats, and ferrets are vaccinated against rabies; vaccinations are also available for horses, cattle, and sheep.
- Keep pets under control; do not allow them to run loose.
- Have pets spayed or neutered, since pets that are fixed are less likely to stray from home and produce unwanted litters.
- Avoid contact with stray pets and wild animals.
- Report stray pets to an animal control officer as well as wild animals that are acting strangely.
- If bitten by an animal, wash the wound with soap and water for 10 to 15 minutes and consult a physician to determine if RPEP, tetanus booster, and antibiotics are needed.
- Pets should not be handled without gloves or other protection directly after they have been exposed to wildlife since they might have saliva on their fur from a rabies-infected animal.

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Health Districts Defined

Section A - Communicable Disease Surveillance

Rocky Mountain Spotted Fever and Other Spotted Fever Rickettsiosis

Missouri's most common tick-borne diseases are members of a group of acute febrile illnesses with skin eruptions that are also known as "spotted fevers." Rocky Mountain spotted fever (RMSF), which is caused by *Rickettsia rickettsii*, is one of these spotted fever disease agents. The term **rickettsiosis** is derived from the scientific name for the *Rickettsia* genus. The wide variety of non-specific, flu-like symptoms produced by spotted fever pathogens like RMSF can make them difficult to diagnose.

Table 1. Rocky Mountain Spotted Fever
Comparative Statistics by Socio-demographic Category, Missouri 2011[1]

		Case Count	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		270	100.00%	4.5	278	-2.90%
Sex	Female	96	35.60%	3.1	95	1.10%
	Male	174	64.40%	5.9	184	-5.40%
Race	Black	4	1.50%	0.5	2	100.00%
	Other	1	0.40%	0.6	1	0.00%
	Unknown	14	5.20%	N/A	45	-68.90%
	White	251	93.00%	4.9	241	4.10%
Age Group	00 to <01	0	0.00%	0	0	0.00%
	01 to 04	3	1.10%	1	4	-25.00%
	05 to 14	15	5.60%	1.9	15	0.00%
	15 to 24	20	7.40%	2.4	26	-23.10%
	25 to 39	40	14.80%	3.5	54	-25.90%
	40 to 64	130	48.10%	6.5	112	16.10%
	65 plus	62	23.00%	7.4	60	3.30%
District	Central	46	17.00%	6.9	52	-11.50%
	Eastern	43	15.90%	1.9	53	-18.90%
	Northwest	26	9.60%	1.7	24	8.30%
	Southeast	68	25.20%	14.3	48	41.70%
	Southwest	87	32.20%	8.3	105	-17.10%

[1]Socio-demographic Category Information is missing for some cases. N/A=No computation made.
*All rates are calculated per 100,000 using 2010 population estimates provided by DHSS, Bureau of Health Informatics.
Data Source: Missouri Health Information Surveillance System (WebSurv).

Patients with RMSF typically seek medical care in the first two to four days of illness; symptoms include a sudden high fever, shaking chills, severe headache, muscle aches, and joint pain. Children sometimes suffer from nausea, vomiting, and a loss of appetite. The classic spotted rash of *R. rickettsii* infection is usually not apparent until the fifth or sixth day of illness and rash is not observed in all people. Additional diagnostic clues can include a low platelet count, low sodium levels, or elevated liver enzyme levels. First-line RMSF treatment for adults and children of any age is doxycycline; fatalities from RMSF are often attributed to a delays in diagnosis and appropriate treatment.

Another spotted fever rickettsiosis that can occur in Missouri is the *R. parkeri* tick-transmitted fever. Infection with *R. parkeri* is characterized by flu-like symptoms and an eschar at the site of the tick bite. *R. parkeri* eschars generally range from 0.5 - 1.5 cm wide, with a central area of ulcerated, crusted, or scabbed skin bordered by inflammation. A spotted rash can also develop. *R. parkeri* illnesses tend to be less severe than RMSF but hospitalization has been reported for some cases. This infection is also treated with doxycycline.

Less pathogenic rickettsial disease agents like *R. parkeri* may be responsible for human illness frequently diagnosed as RMSF. Because they are so closely related, laboratory tests that detect the immune system's response to these two agents cannot distinguish one from the other. Confirming the identity of the infecting agent requires the use of molecular, culture, and antigen-detection techniques on biopsy or swab samples taken from the spotted rash or eschar.

Section A - Communicable Disease Surveillance

Rocky Mountain Spotted Fever and Other Spotted Fever Rickettsiosis - Continued

In 2011, Missouri LPHAs identified 270 confirmed and probable cases of RMSF illness. This count translates to a statewide incidence rate of 4.5 per 100,000, which is slightly lower than the median count of RMSF cases for the previous five-year period of 2006 to 2010. The incidence of RMFS in men was almost twice that of women, with 5.9 reported illnesses per 100,000 men compared with 3.1 cases per 100,000 in women. An overrepresentation of males diagnosed with RMSF may be due to men having greater exposure to ticks through occupational and recreational activities. Another consistent trend in RMSF surveillance is the disproportionate toll the disease inflicts on people age 40 and older, a segment of the population tends to be more susceptible to severe infection and complications. Of the 270 Missouri cases identified in 2011, individuals age 40 and older accounted for over 70% of the state's reports; 93% of reported cases are white.

RMSF cases were identified statewide; however, in 2011 three health districts, Central, Southeast, and Southwest, accounted for 74% of Missouri's RMSF reports. The incidence rate for each of these Districts is greater than the statewide rate, at 6.9, 14.3, and 8.3 per 100,000 respectively. Eastern and Northwest Districts had incidence rates below 2 cases per 100,000. There are no independent measures of the geographic distribution of tick density or infection prevalence, so it is not known whether regional variations are significant.

Comparison to National Data: In the last 10 years, Missouri's RMSF incidence rate has ranged from a low of less than 1 case per 100,000 in 2003 to a record high of almost 7 cases per 100,000 in 2008. The 4.5 cases per 100,000 rate for 2011 is substantially lower than the 2008 rate; however, Missouri's RMSF incidence rate has remained at a level of more than 4 cases per 100,000 in four of the last five years (2006 – 2010). In contrast, over the last ten years, the yearly incidence rates of RMSF for the United States remained below 1 case per 100,000, with only a slight upward trend over the period.

Societal trends like the extension of housing developments into woodlands and recreational activities focused in rural settings have undoubtedly exposed more people to ticks, leading to increasing reports of tick-borne diseases. Limitations of public health surveillance for RMSF should be noted, however, including uncertainty generated by "false positive" laboratory reports. According to CDC, up to 10% of currently healthy people in some areas may have elevated antibody levels due to past exposure to *R. rickettsii* or other spotted fever rickettsiosis disease agents.

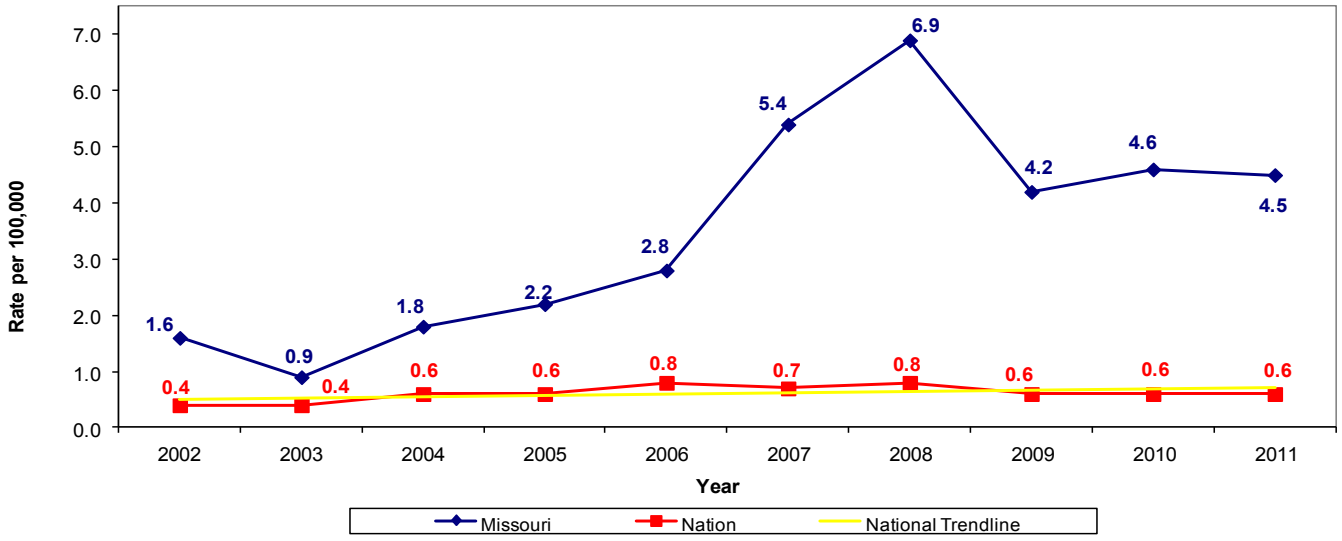
Avoiding tick bites is the key to disease prevention. In Missouri, the brown dog tick and the American dog tick transmit *R. rickettsii* and the Gulf coast tick transmits *R. parkeri*. Current research indicates that tick-checks are an effective strategy in avoiding tick bites. Beyond avoiding brushy areas and long grass where ticks quest, the best practice to avoid tick bites is to use an insect repellent with the active ingredient DEET. Other active ingredients are not as effective as 20% - 50% DEET in repelling ticks. A repellent with up to 30% DEET can be applied on children over two months of age; it is critical that parents apply the repellent.

Section A - Communicable Disease Surveillance

Rocky Mountain Spotted Fever and Other Spotted Fever Rickettsiosis - Continued

In addition, to minimize exposure, wear light-colored clothing, that covers legs and arms so that ticks may be more easily seen; and tuck trousers into socks. May and June are the peak months for tick-borne disease in Missouri. In the summertime, tick activity tends to slow down when temperatures are high and rainfall declines, with a resurgence of activity as cooler weather sets in. Studies have shown that trimming back bushes, tall weeds, and low-hanging trees increases sunlight penetration to the soil and air circulation in the yard, marking it more difficult for ticks to quest. Pets should be treated with a spot-on parasite medication.

Rate of Reported Cases, Confirmed and Probable, Rocky Mountain Spotted Fever, by Year
Missouri versus United States



Additional Website Resources

CDC Health Topics

CDIRM

Health Districts Defined

Section A - Communicable Disease Surveillance

Shigellosis

Shigellosis is an infectious disease caused by a group of bacteria called *Shigella*. Most people infected with Shigellosis develop diarrhea, fever, and stomach cramps starting a day or two after they are exposed to the organism. Stools are frequent, loose to watery, of small volume, and often mucoid and/or bloody. The diarrhea is usually self-limiting, resolving in 5 to 7 days. Young children and the elderly may be more severely affected, in some cases needing hospitalization. However, some individuals who are infected may have no symptoms at all, but could still pass the *Shigella* bacteria to others.

Table 1. Shigellosis
Comparative Statistics by Socio-demographic Category, Missouri 2011

		Case Count	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		182	100.00%	3	1,046	-82.60%
Sex	Female	94	51.60%	3.1	540	-82.60%
	Male	88	48.40%	3	506	-82.60%
Race	Black	18	9.90%	2.5	423	-95.70%
	Other	7	3.80%	4.5	2	250.00%
	Unknown	16	8.80%	N/A	143	-88.80%
	White	141	77.50%	2.8	392	-64.00%
Age Group	00 to <01	3	1.60%	3.9	25	-88.00%
	01 to 04	38	20.90%	12.1	431	-91.20%
	05 to 14	71	39.00%	9	355	-80.00%
	15 to 24	10	5.50%	1.2	53	-81.10%
	25 to 39	26	14.30%	2.3	104	-75.00%
	40 to 64	25	13.70%	1.3	52	-51.90%
	65 plus	6	3.30%	0.7	16	-62.50%
	Unknown	3	1.60%	N/A	2	50.00%
District	Central	11	6.00%	1.7	43	-74.40%
	Eastern	27	14.80%	1.2	517	-94.80%
	Northwest	50	27.50%	3.2	75	-33.30%
	Southeast	5	2.70%	1.1	66	-92.40%
	Southwest	89	48.90%	8.5	66	34.80%

[1]Socio-demographic Category Information is missing for some cases. N/A=No computation made.
*All rates are calculated per 100,000 using 2010 population estimates provided by DHSS, Bureau of Health Informatics
Data Source: Missouri Health Information Surveillance System (WebSurv).

Humans are the primary source of this infectious disease. Some other primates, such as certain species of monkeys or chimpanzees can carry or pass the organism. *Shigellosis* is transmitted by the fecal-oral route. When those who are infected fail to adequately wash their hands following a bowel movement, they subsequently transfer the organisms to food or objects that are ingested or placed in someone else's mouth. The infectious dose is quite small, from 10 to 200 organisms, compared to 10^6 (1,000,000) organisms for many strains of *Shigella*. For this reason, it is extremely easy to spread shigellosis from person-to-person. Shigellosis can be a particular problem in group settings with people who may not have good bathroom hygiene, such as childcare centers.

Statewide in 2011, there were 182 reported cases of Shigellosis in Missouri. This represents a statewide incidence rate of 3.0 per 100,000 population. This is a huge decrease from the 2009 incidence rate of 17.7 per 100,000 population. The number of reported cases decreased by 88.5% from the 1,582 cases reported in 2010, and is and 82.6% decrease from the 5-year median of 1,046 cases. There was one reported outbreak of Shigellosis in 2011 as compared to six reported in 2010.

The Southwest District was the only district showing an increase in reported cases, 34.8% above their 5-year median. There was one outbreak of Shigellosis reported for 2011. It involved an elementary school located in the Southwest District.

Section A - Communicable Disease Surveillance

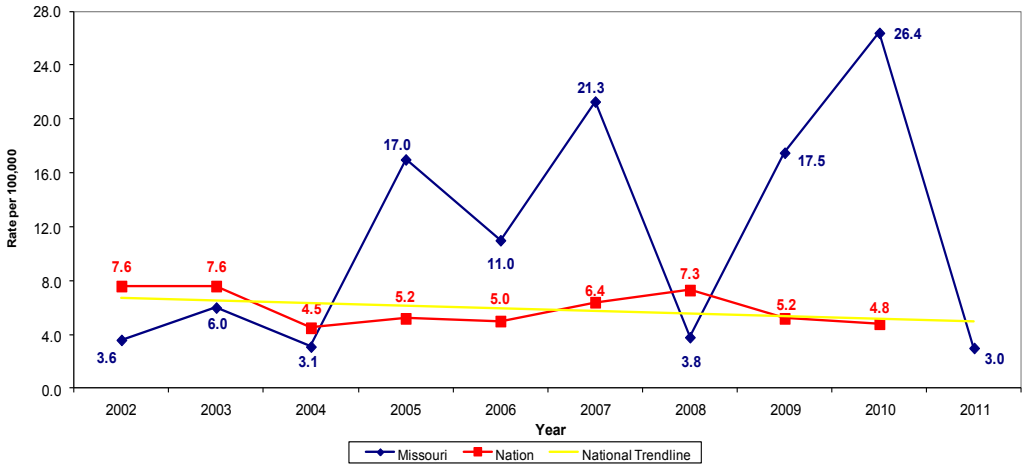
Shigellosis - Continued.

Comparison to National Trend: Shigellosis often displays a temporal trend, with periodic outbreaks resulting in high rates of infection followed by relatively lower rates. This has been the pattern in Missouri over the last decade. Fueled by an outbreak in the Eastern District in 2009, which extended into 2010 and supplemented by an outbreak in the Northwestern District in 2010, both 2009 and 2010 were well above the National rate. For 2011, however, the absence of any major outbreaks allowed Missouri's rate to fall from more than 5 times the National rate in 2010 to well below the projected 2011 national rate. The National rate for 2011 is not yet available, but is estimated to be in the range of 3.2 – 4.0 cases per 100,000. Missouri's rate for 2011 was 3.0 cases per 100,000.

Good hand hygiene, education and sanitation are the most effective methods of preventing the transmission of shigellosis. In certain settings, antibiotics may be used to shorten the length of time an infected person sheds the organism in their stool. However, recent studies have shown increasing resistance to the most commonly prescribed antibiotics, so sensitivity studies are strongly recommended when considering antibiotic treatment. Significant efforts have been made to alert physicians to the rise in antibiotic resistance and to encourage sensitivity testing so that an appropriate antibiotic may be chosen. Even with the use of appropriate antibiotics, strict adherence to good hygienic practices remains the most effective method for controlling the spread of shigellosis. A concerted educational effort involving parents, child care providers, and the private and public health communities, should be considered during any outbreak.

The decrease in the number of reported cases observed in 2011 could, in part, be attributed to the publication of Prevention and Control of Communicable Diseases, A Guide for School Administrators, Nurses, Teachers, Child Care Providers, and Parents or Guardians. This manual was distributed throughout the community, as well as posted on DHSS' website.

Figure 1. Rate of Reported Cases, Confirmed and Probable, Shigellosis, by Year
Missouri versus United States 2002-2011



Additional Website Resources

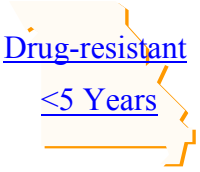
CDC Health Topics

CDIRM

Health Districts Defined

Section A - Communicable Disease Surveillance

Streptococcus pneumoniae, drug-resistant invasive disease and invasive in children less than five (5) years



Streptococcus pneumoniae (S. pneumoniae) also called pnuemococcus, are bacteria that are often found in the nose and throat of humans. Studies suggest S. pneumoniae can be found in 5% - 70% of healthy adults and up to 59% of healthy children. There are more than 90 serotypes that have been identified based on differences in the polysaccharide capsule produced by the pathogen. The distribution of the serotypes varies regionally and by the age of the infected persons.

Streptococcus pneumoniae are spread from person-to-person through respiratory droplets or direct contact with respiratory secretions. The majority of infected persons will not develop an illness though will be colonized with the bacteria and therefore are able to continue the spread of this opportunistic pathogen. Rates of infection are typically higher among infants, young children, and the elderly. Persons with immunocompromising or certain chronic conditions are also at a greater risk for S. pneumoniae associated disease. These conditions can include pneumonia, bacteremia, meningitis, peritonitis, and arthritis. In addition, S. pneumoniae is a common cause of ear infections particularly among children. The incubation period is not known though thought to be one to four days. Pneumococcal infections are most common in winter months and viral upper respiratory tract infections, including influenza, can predispose persons to S. pneumoniae associated disease.

Antibiotics are typically used to treat S. pneumoniae infections. Treatment decisions have become more complicated as the bacteria have developed resistance to certain antibiotics previously used for treatment. Until the mid-1970's, most relevant antibiotics readily treated S. pneumoniae infections. In some areas of the United States, up to 40% of invasive S. pneumoniae isolates are resistant to penicillin. Because resistance is common, susceptibility testing of S. pneumoniae isolates is often used to determine the appropriate antibiotic therapy.

Pneumococcal vaccines play an important role in preventing invasive S. pneumoniae infections. Currently, there are two pneumococcal vaccines available in the United States. The 23-valent polysaccharide vaccine (PPSV23) is recommended for all adults 65 years of age and older, and for persons two years of age and older with certain preexisting medical conditions. The pneumococcal conjugate vaccine (PCV13) is recommended for all children younger than 24 months of age and children 24-59 months of age with a high risk medical condition. Since the introduction of the pneumococcal conjugate vaccines in 2000 through 2006, the incidence of vaccine-type invasive pneumococcal infections decreased by 99% and the incidence of invasive S. pneumoniae decreased by 77% in children younger than 5 years of age in the United States.

Section A - Communicable Disease Surveillance

Strep Pneumoniae - Continued

Surveillance for S. pneumoniae associated diseases can vary among states nationally. The infections are determined to be invasive when the bacteria are identified in a normally sterile site including blood, cerebrospinal fluid, or less commonly joint, pleural, or pericardial fluid. In Missouri, two categories of invasive S. pneumoniae infections are reportable: 1) invasive diseases in children less than five years of age; and 2) invasive disease in all ages where the S. pneumoniae is determined to be resistant to at least one antimicrobial agent approved for use in treating the infection. A summary of S. pneumoniae invasive disease based on each of the two reporting categories is provided below.

Streptococcus pneumoniae Invasive Disease in Children Less than Five Years of Age

In 2011, a total of 34 cases of invasive S. pneumoniae infections were reported among children less than five years of age in Missouri. The resulting state rate was 0.6 cases per 100,000 population and represents a 12.5% decrease from the previous five year median. Approximately 70% of cases occurred among white children, however, the race specific incidence rate was 2.2 times greater among black children compared to white children. All of the reported cases (34 cases) consisted of children aged 1 – 4 years of age though the age specific incidence rates were higher among infants. Invasive S. pneumonia infections in children less than five years of age were reported from all districts of the state. Increases in reported cases were observed in the central, southwest, and northwest districts while a decrease was observed in the eastern district, and the southeast district saw no change.

Table 1. Strep Pneumoniae, lt 5 Years, Invasive Comparative Statistics by Socio-demographic Category, Missouri 2011[1]

		Case Count	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		34	100.00%	0.6	40	-15.00%
Sex	Female	18	52.94%	0.6	13	46.15%
	Male	16	47.06%	0.5	20	-20.00%
Race	Black	8	23.53%	1.1	9	-11.10%
	Other	2	5.88%	1.3	1	100.00%
	Unknown	1	2.94%	N/A	7	-85.70%
	White	23	67.65%	0.5	20	15.00%
Age Group	00 to <01	10	29.41%	13.1	10	0.00%
	01 to 04	24	70.59%	7.6	25	-4.00%
	05 to 14	0	0.00%	0	0	0.00%
	15 to 24	0	0.00%	0	0	0.00%
	25 to 39	0	0.00%	0	0	0.00%
	40 to 64	0	0.00%	0	0	0.00%
	65 plus	0	0.00%	0	0	0.00%
District	Central	3	8.82%	0.5	2	50.00%
	Eastern	9	26.47%	0.4	17	-47.06%
	Northwest	11	32.35%	0.7	9	22.20%
	Southeast	4	11.76%	0.8	4	0.00%
	Southwest	7	20.59%	0.7	1	600.00%

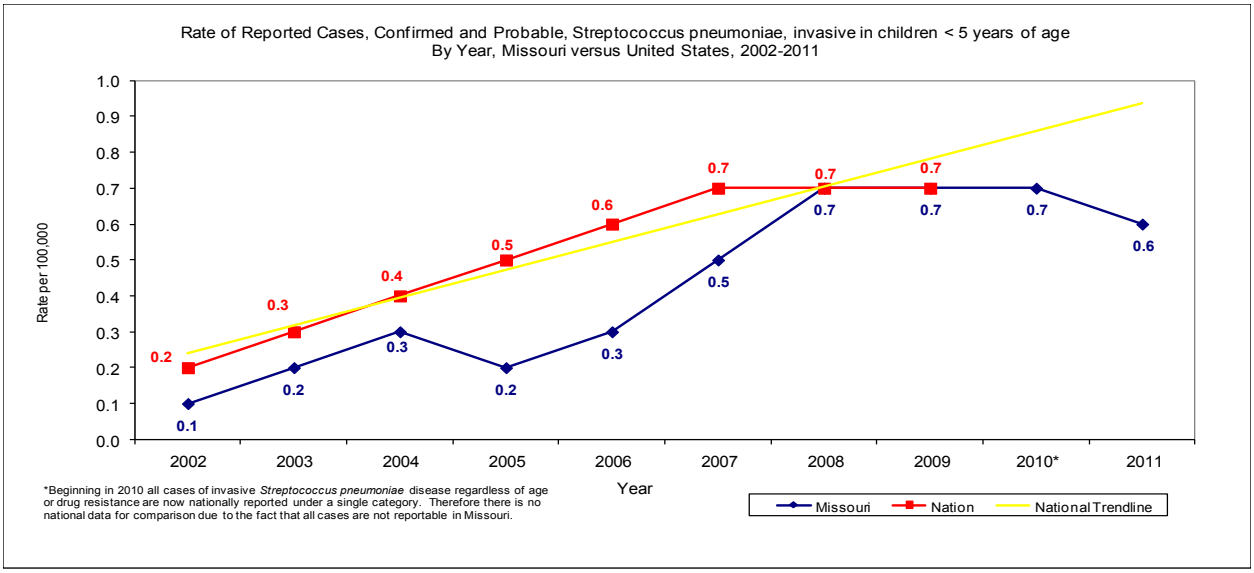
[1]Socio-demographic Category Information is missing for some cases. N/A=No computation made.
*All rates are calculated per 100,000 using 2010 population estimates provided by DHSS, Bureau of Health Informatics
Data Source: Missouri Health Information Surveillance System (WebSurv).

Comparison to National Data: From 2002 through 2010 the observed incidence of reported S. pneumoniae invasive diseases cases reported among children less than five in Missouri and nationally gradually increased. However, during the 2011 period the Missouri rate dropped below the national rate of 0.7/100,000 population to 0.6/100,000 population. No outbreaks of invasive S. pneumoniae were reported among Missouri children less than five years of age in 2011.

Section A - Communicable Disease Surveillance

Strep Pneumoniae - Continued

Streptococcus pneumoniae remains one of the two most common causes of bacterial meningitis in infants and young children in the United States. The introduction of the PCV7 vaccine has greatly reduced the incidence of S. pneumoniae infections; however, invasive disease caused by serotypes of the bacteria not included in the vaccine has increased nationally. In addition, treatment of invasive disease can be challenging given the propensity of the organism to develop resistance to antibiotics traditionally prescribed for treatment. Streptococcus pneumoniae is easily spread particularly among children. Continued surveillance for this opportunistic pathogen is important as effectiveness of the pneumococcal vaccines is evaluated and monitored for changing trends of invasive disease among those most vulnerable, which includes the very young.



Streptococcus pneumonia, Drug-Resistant Invasive Disease

In 2011, a total of 105 cases of invasive S. pneumoniae infections reported among Missouri residents were caused by isolates resistant to an antibiotic approved for use in treatment and determined to be drug-resistant. The resulting state rate was 1.8 cases per 100,000 population, which is an increase from the state rate of 1.5 cases per 100,000 population in 2010. Females accounted for 54% of reported cases. Race specific rates were higher among blacks than whites, 2.5 and 1.5 per 100,000 population respectively. Missouri residents 65 years of age and older, are at greatest risk for drug-resistant S. pneumoniae invasive disease, with age specific rates approximately two times greater than the next highest age group. Reported cases increased in the northwest, southeast and southwest district of the state. In the central district there was a 42.9% decrease and no change in the eastern district. The highest rates (6.5 cases per 100,000 population) were reported among residents of the Southeast district, which is 3.6 times greater than the overall state rate. The reason for the higher rate in Southeast Missouri is unknown.

Section A - Communicable Disease Surveillance

Strep Pneumoniae - Continued

Comparison to National Data: The overall rates of drug-resistant invasive S. pneumoniae infections nationally have remained relatively static during the previous ten years. Prior to 2008, the rates in Missouri were typically below the rates nationally. During the last four years, the rates in Missouri have been slightly above the national rates. The fluctuation in rates of the disease in Missouri is not fully understood. No outbreaks of invasive drug-resistant invasive S. pneumoniae infections were reported among Missouri residents in 2011. Beginning in 2010, comparison to national data cannot be done. In 2010 all cases of invasive streptococcus pneumonia regardless of age or drug-resistance became nationally reportable. Therefore, there is no national data for comparison due to the fact that all cases are not reportable in Missouri, only invasive disease in children less than 5 years of age and drug-resistant invasive disease.

Table 2. Strep Pneumoniae, Drug-Resistant
Comparative Statistics by Socio-demographic Category, Missouri 2011[1]

		Case Count	% of Total	Rate per 100,000	5-Year Median	% Change from 5-Year Median
State of Missouri		105	100.00%	1.8	74	41.90%
Sex	Female	57	54.30%	1.9	44	29.50%
	Male	48	45.70%	1.6	37	29.70%
Race	Black	18	17.10%	2.5	13	38.50%
	Other	3	2.90%	1.9	0	N/A
	Unknown	9	8.60%	N/A	10	-10.00%
	White	75	71.40%	1.5	46	63.00%
Age Group	00 to <01	0	0.00%	0	1	-100.00%
	01 to 04	1	1.00%	0.3	2	-50.00%
	05 to 14	5	4.80%	0.6	2	150.00%
	15 to 24	2	1.90%	0.2	0	N/A
	25 to 39	10	9.50%	0.9	4	150.00%
	40 to 64	35	33.30%	1.8	26	34.60%
	65 plus	51	48.60%	6.1	30	70.00%
	Unknown	1	1.00%	N/A	0	N/A
District	Central	4	3.80%	0.6	7	-42.90%
	Eastern	31	29.50%	1.4	31	0.00%
	Northwest	18	17.10%	1.1	10	80.00%
	Southeast	31	29.50%	6.5	21	47.60%
	Southwest	21	20.00%	2	5	320.00%

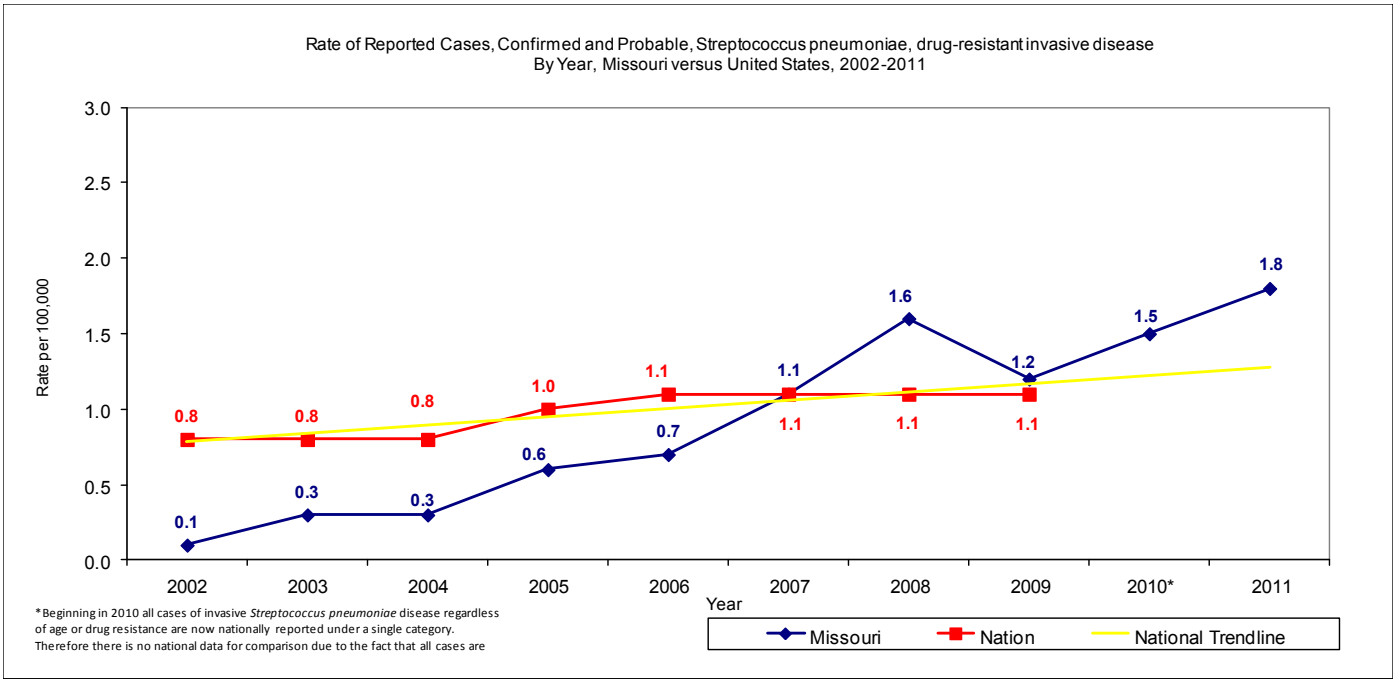
[1]Socio-demographic Category Information is missing for some cases. N/A=No computation made.
*All rates are calculated per 100,000 using 2010 population estimates provided by DHSS, Bureau of Health Informatics
Data Source: Missouri Health Information Surveillance System (WebSurv).

Invasive Streptococcal pneumonia disease causes significant morbidity and mortality each year in the United States. A global trend of increasing antimicrobial resistance, but with wide variations at national levels, is well documented in the literature. Recent studies have now shown that Streptococcal pneumonia resistance rates is directly associated with antibiotic selection pressure on a national level. Despite the availability of pneumococcal vaccines for disease prevention and antibiotics used to treat sensitive strains appropriately 14% of hospitalized adults with invasive disease caused by S. pneumonia will die due to the illness. The surveillance of invasive S. pneumonia is critical in the continued effort to evaluate the effectiveness of the pneumococcal vaccine and efforts to get people vaccinated.

Pneumonia can be prevented with vaccines. Following good hygiene practices can also help prevent respiratory infections. This includes washing your hands regularly, cleaning hard surfaces that are touched often (like doorknobs and countertops), and coughing or sneezing into a tissue or into your elbow or sleeve. You can also reduce your risk of getting pneumonia by limiting exposure to cigarette smoke and treating and preventing conditions like diabetes and HIV/AIDS.

Section A - Communicable Disease Surveillance

Strep Pneumoniae - Continued



Additional Website Resources

CDC Health Topics

CDIRM (drug-resistant)

CDIRM (<5 years)

Health Districts Defined

Glossary

Agent (of Disease) - A factor (e.g. virus, bacterium , parasite, chemical, or radiation) whose presence, excessive presence, or absence of, is essential for the occurrence of disease.

Bioterrorism - The intentional use of chemical, biological, or radiological agents as weapons during acts of violence or intimidation.

Case - A person or animal identified as having a particular disease.

Confirmed Case - surveillance definition, a case usually with positive laboratory results for the disease, generally associated with signs and symptoms of the disease.

Probable Case - surveillance definition, a case usually with a clinically compatible illness that is epidemiologically linked to a confirmed case.

CD - Communicable Disease (or Infectious Disease) - diseases caused by biological agents such as a virus, bacterium or parasite.

CDC - Centers for Disease Control and Prevention.

Cluster - a group of individuals who manifest the same or similar signs and symptoms of disease.

Communicable - Able to spread disease from one person or species to another, either directly or indirectly; contagious.

Disseminated intravascular coagulopathy - bleeding into the skin.

ELC - Epi Laboratory Capacity Grant.

Endemnicity - Amount or severity of a disease in a particular geographic area.

Epidemiology - The study of how and why diseases and other conditions are distributed within the population the way they are.

Epidemiologist - An investigator who studies the occurrence of disease or other health-related conditions or events in defined populations.

Fecal-oral - The transmission of an infectious agent by ingestion of feces.

Five-year Median - A data set which includes five consecutive year data totals where half of the elements have a larger value and half of the elements have a lesser value. The median can be thought of as the "middle" of the data.

Glossary

Incidence - The number of new cases of a disease occurring in a population during a defined time period.

Incidence Rate - The rate at which new events occur in a population. For examples of the calculations, see page 49.

Incubation period - The time between exposure to an infectious agent and appearance of the first sign or symptom of the disease.

Leukopenia - Abnormal decrease of white blood cells usually below 5000/mm^3.

Malaise - A subjective sense of discomfort, weakness, fatigue, or feeling rundown that may occur alone or accompany other symptoms and illnesses.

Mean - Commonly called average, is defined as the sum of the observations divided by the number of observations. For examples of the calculations, see page 49.

Median - The point in a data set where half of the elements have a larger value and half of the elements have a lesser value. The median can be thought of as the "middle" of the data. For examples of the calculations, see page 49.

Morbidity - Having disease, or the proportion of persons in a community with the disease.

Mortality - Refers to death.

Myalgia - Tenderness or pain in the muscles; muscular rheumatism.

Neonate - a newborn infant up to one month of age.

Outbreak (or epidemic) - the occurrence in a community or region of an illness(es) similar in nature, clearly in excess of normal expectancy and derived from a common or a propagated source.

Pandemic - An outbreak occurring over a wide geographic area; widespread.

Pathogen - An organism capable of causing disease.

Pathogenic - Capable of causing disease.

PCR - Polymerase Chain Reaction. A laboratory procedure used to identify pathogens through amplification of genetic material.

PFGE - Pulse Field Gel Electrophoresis. A laboratory procedure of bacterial strain typing.

Polysaccharide capsule- A protective covering made out of sugar molecules that surrounds some bacteria.

Glossary

Prevalence - The total number of cases of a disease existing in a given area at any given time.

Preventable TB case:
- A person with a previous positive TB skin test who is a candidate for treatment and not offered treatment;
- A person with a risk factor for TB who is never offered a TB skin test; and/or
- A secondary case to a preventable case.

Quartile - Any of three values which divide the sorted data set into four equal parts, so that each part represents 1/4 of the sample or population.

Recreational Water - Swimming pools, hot tubs, water parks, water play areas, interactive fountains, lakes, rivers, creeks or oceans.

Risk Factors - The presence of any particular factor known to be associated with health related conditions considered important to prevent.

Sequela: A condition following and resulting from a disease.

Serotype - To distinguish organisms on the basis of their constituent antigen(s).

Surveillance (of disease) - An ongoing mechanism to collect, analyze, interpret and distribute information.

Trend - Shows movement consistently in the same direction over a long time.

Thrombocytopenia - An abnormal decrease in the number of platelets.

Vaccine - A suspension of attenuated live or killed microorganisms or fractions thereof, administered to induce immunity and thereby prevent infectious disease.

Vector - A carrier, usually an insect or other arthropod.

Statistical Calculations

Examples of Calculations

Mean

Calculate the **mean** by adding all of the values and dividing the sum by the number of observed values (in this case 11).

55 + 12 + 60 + 46 + 85 + 27 + 39 + 94 + 73 + 5 + 60 = **556**

556 / 11 = **50.54545455**

The **mean** for this data set is **50.5** (result is rounded).

Median

The **median** is the element that falls in the middle of the ordered set. Rank the values from least to most:

39, 60, 73, 85, 55, 27, 12, 94, 60, 46, 5

In this example the **median** is the sixth element in the set, which is **55**.

5, 12, 27, 39, 46, **55**, 60, 60, 73, 85, 94

Incidence rates are calculated with the following equation:

(X divided by Y) multiplied by K

Where:
X is the number of cases for a specified time period
Y is the population (possibly exposed) for the same time period
K is a constant (often 1000 or 100,000) that transforms the result into a uniform quantity allowing comparison with other similar quantities.

Example: The Southwest Region has 86 cases of Hepatitis A in 1993, compared to 63 cases in the Central Region for that year. The 1993 population for the Southwest Region is 694,712, while the population for the Central Region is 621,740.

Southwest Region: **(86 / 694,712) * 100,000 = 12.4**
Central Region: **(63 / 621,740) * 100,000 = 10.1**

A comparison of the two incidence rates shows that in 1993 Southwest Region has a slightly higher incidence of Hepatitis A (12.4 reported cases per 100,000 population) than the Central Region (10.1 reported cases per 100,000 population).